RAILROAD GAZETTE

FRIDAY, AUGUST 25, 1893

CONTENTS.

Contributions.

Roberts Deflecting Plate.

CHARLESTON, S. C., Aug. 12, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Aug. 11 "Extension Front" criticises the way in which we locate the diaphragm plate which you showed on page 561 of the *Railroad Gazette*, July 28. He recommends a position for the plate at an angle which would allow the diaphragm to be extended to or beyond the steam pipes, making the use of the perforator plate unnecessary. This idea is not new to me, for I presume I was one of the first to use a diaphragm so placed, and it was shown in the *National Car Builder*, July, 1883.

Experiments in service, with different classes and kinds of engines, with varied conditions as to quality of coal, steam pipe and exhaust pipe arrangements, as well as mesh and arrangement of spark arrester, made necessary in hauling cotton, showed that a change in the angle of the diaphragm plate, as then recommended, is advantageous. On the South Carolina Railway we have some engines with the plate extended beyond the steam pipes, but have changed many to the plan condemned by "Extension Front," that is, to stand 12 in. from the flue sheet at the bottom; and with this arrangement we get good steaming engines, using nozzles not less than one-quarter of the diameter of the cylinders, which is, I believe, good practice.

Coal costs us $2.87 a ton. As our line is short and yet has three terminals which require extraordinary switching service, the record of fuel cost would naturally be rather high; yet for the year 1892 it was 8.5 cents per mile for all service, and this too where engines were run in the chain gang system, which is not conducive to fuel economy.

We have used the perforated plate with various positions of draft plate and have found economies in all cases. We found that corresponding economies were obtained on other roads than our own where the draft plate was arranged differently from either of our plans.

E. M. ROBERTS, *Supt. Motive Power.*

Concerning Some Recent Locomotives.

GRAND TOWER, Ill, July 8, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of April 14, 1893, you show a line drawing of a "Big Four" passenger, American-type locomotive, on which the rear drivers are marked as carrying 2,300 lbs. more than forward (main) drivers. Unless this is a mistaken placing of the weights (reversed positions), I would be interested to know why this difference is desired and how it is effected, the equalizers being apparently of usual construction as to distribution of weight.

In your issue of June 23, 1893, is shown a N. Y., N. H. & H. locomotive, with overhung springs and equalizers and a 41 in. × 120 in. firebox (34.1 sq. ft. of grate). It would be interesting to many, I think, to see a cross-section of this engine—to scale—which reconciles such diametrically opposed conditions.

What is the object of placing main rods outside of parallel rods in L. S. & M. S. "Exposition Flyer"? It has cylinders' centres spread 84 in. G. B. CUTLER.

The object in placing main rods of the Lake Shore engine outside of parallel rods is that it permits using the same cylinder pattern which is used for the 10-wheel passenger engines. This is the chief reason; yet, the placing the rods as stated gives a wider spread of cylinders and greater clearance between truck wheel and cylinder head casings.

Concerning the "Big Four" engine the builders inform us that there was no special purpose to get a precisely equal distribution on the drivers. They write: "The fact that the rear drivers carry a slight excess of weight is not unnatural; in fact, we know of hardly any locomotives where an equal distribution is secured, although it may be aimed at. Of course this could be compensated for by a slight change in equalizing, but we find that in weighing locomotives on scales in order to get at the exact distribution, a variance often exists, and is directly traceable to the way in which the engine is weighed, it being almost impossible to get the same distribution of weights in successive trials. The excess weight referred to was merely a slight irregularity that may easily occur and which we do not think is of any great moment."

Torpedoes, Fusees and the Block System.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with some interest the letter of Langdon on fusees, in your issue of June 23, as well as the reference to this appliance in Colonel Haines' address in your issue of June 30 and your comments thereon. As I have never been able to get up any enthusiasm over the "block system" and have not brought myself to the point of looking upon flagging as an "absurdity," I had begun to regard myself as something of a fossil and as being outside the march of progress, but after reading again Langdon's letter I have taken heart and feel that, Gentile as I am, I may, after all, be more "up to date" than some of the chosen people.

Your editorial guarantees Langdon as a trainman, and he claims to have had 25 years' experience on some of our most prominent railroads, and yet he devotes nearly a fourth of his letter to the difficulties and dangers incident to the use of torpedoes, because "they cannot be applied to the rail unless a man leaves the train to clamp them on." Evidently he has never seen nor heard of the torpedo placer, by which the torpedo is clamped to the rail by a flagman standing on the rear platform while the train moves at full speed. Really, one wonders where this trainman had his experience, reaching over nearly one generation. Not much confidence can be inspired by advice based upon such data.

As I read Langdon's letter, the points he makes are as follows: The torpedo is good for nothing, because: 1, torpedoes do not indicate the distance or time between trains; 2, they attract the attention of the engineer only by their detonation; 3, they give no warning to the men on the rear end of the train; 4, they cannot be applied unless the flagman leaves the train; 5, of no value during heavy storms of snow; 6, it is ignored by the enginemen unless they know that they are immediately preceded by another train or receive other danger signals in connection with it.

The fusee should be substituted for it because: 1, it is a portable time-limit block; 2, the conductor and brakeman have at almost the same time the same notification as the engineer of impending danger; 3, they can be used while running at speed as a protection against following trains. The question of expense is disposed of as usual, as "certainly not worthy of consideration."

Upon which, being a plain man, not easily moved by the flowers of rhetoric, I am tempted to observe:

1. It is true that the torpedo does not indicate the distance between trains, but then neither does the fusee. The fusee does indicate the time between trains, or, to be accurate, it indicates that the preceding train has been gone not longer than the length of life of the fusee, five minutes or ten minutes or whatever time it is built to burn, while this information cannot be conveyed by the torpedo in common use, and it is undoubtedly a defect of most serious character, but it is conveyed by the "Bennett torpedo," a torpedo which is exploded by a time fuse, the fuse being ignited in the same manner as is the fusee. By this appliance the torpedo can be set to remain until exploded by the following train or can be set to be exploded by the time fuse in five minutes, ten minutes or any other interval, unless sooner exploded by a train, so that in this regard it possesses all the advantages of a fusee and more. 2. If the attention of the engineer is attracted, it would seem a matter of indifference whether it be by sight or by hearing. 3. If the engineer does his duty the warning is conveyed to the other men on the train by whistle signal. 4. By the use of the torpedo placer torpedoes can be applied without the flagman leaving the train. 5. It has not been my experience that torpedoes are inaudible during snowstorms. 6. "Every one knows enginemen use their own judgment as to the whereabouts of the preceding train," but not, I think, when one torpedo is used indicating danger, as is implied, but where two are used, indicating caution. To some extent they are tempted into this habit by being signaled by torpedoes after the purpose of the same, as a signal, has lapsed. This can largely be overcome by the Bennett torpedo.

But, after all, it is, as you say, a matter of discipline, and it hardly seems to me fair to put the responsibility for the discipline on the torpedo. As to the fusee, we use them with limitations and like them, and are not disposed to underrate them, but, unlike your correspondent, I am unable to put aside the question of expense with a wave of the hand as "not worthy of consideration." Unfortunately, the fusee costs about thirty-six times as much as does the torpedo. They will do just what your correspondent says they will do. It is not clear to me but that a propor torpedo properly handled will do the same thing.

There seems to be a disposition in some quarters to manifest a great discontent with existing things and a great confidence in imaginary conditions. I have no sympathy with that condition of mind; my experience has not taught me that the grass is any greener in the next field, however attractive it may look from a distance. We have our troubles and they are great ones, but I am convinced that they are best to be met by facing them boldly with the weapons we have in hand and by securing a high state of efficiency and discipline in the forces under our command. R. E. L.

Standard Live Loads for Railroad Bridges.

KANSAS CITY, MO., Aug. 11, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of July 28 you published in direct sequence to a paper of mine on the "Live Load" question, some editorial comments thereon by the *Engineering Record*. Now I ask you to publish simultaneously with the *Engineering Record* the following answer to their editorial comments:

This idea of using a single or double concentration in connection with a constant car load per lineal foot, as an equivalent for a train load of two locomotives with cars, has been held by a small minority of engineers interested directly or indirectly in bridge designing, and has acted as a stumbling block in my path ever since I undertook the task just mentioned. It seems to me that I have proved conclusively that there is not a single point in favor of using the "Concentration System" (either single or double), and that it is inferior in every respect to the "Equivalent Uniform Load System."

The only idea ever advanced which showed any good reason for adopting the single or double concentration system is that an engineer having no books or papers at hand could carry in his mind such a simple loading as, for instance, a car load of 3,000 lbs. per lineal foot combined with a single concentration of 30,000 lbs., while he could not remember the equivalent loads for the various spans. My latest investigations and the discussions thereon, however, have brought out the fact that, as far as floor systems and plate girder spans are concerned, the concentration must vary for each span length, consequently the benefits to be derived from the supposed simplicity of the loading vanish.

J. A. L. WADDELL.

The following is the essential part of the letter to the editor of the *Engineering Record*:

In your editorial of June 3 you write thus:

"*A uniform load with a single concentration at its head or at any point can be made to cover every possible supposition of loading or length of span without any juggling with an equivalent device and with approximations at least as close to the ideal concentration stresses as those of the equivalent uniform loads and possibly more so.*" It was this statement which induced me to make the calculations and write the letter that appeared in your issue of July 29, in which I showed said statement to be incorrect.

In your editorial of July 29, you say:

"We have never made as a 'claim' the observation that the single system with uniform loads would give as accurate results as the equivalent uniform loads, although we believe there is practically no difference, and nothing has yet been shown to the contrary. On the other hand, we have distinctly claimed that any possible difference between the two systems, in this respect, is of no consequence, and we still make that claim."

It seems difficult to reconcile these two editorial statements.

Again, referring to the first quotation here given, is not any reader justified in assuming that the "concentration" which you indorse is intended to be a constant for each train load? If not, why the reference to there being "no juggling with an equivalent device"? But judging by your editorial of July 29, you have concluded that it is necessary to vary the value of the concentration with the span length for floor systems and plate girder spans. It seems to me that this requires what you term "juggling."

My latest investigations have shown the following:

First. That the concentration method will not give satisfactory results for end shears on plate girder spans.

Second. That if the concentration method be adopted for moment computations for floor systems and plate girder spans, it will be necessary to vary the value of the concentration for each length of span.

Third. That if the concentration for trusses be taken as constant for any one loading, the variations from exactness for main web members will be in general from two to ten times as great as the corresponding variations from exactness caused by the use of the "Equivalent Uniform Load Method." This was shown very clearly in Table IV., which, unfortunately for my side of the question, you did hot find space to insert in your issue of July 29. As it bears upon the subject in hand, I shall ask you to be so kind as to insert it here. [Was published in the *Railroad Gazette.*]

Now, supposing that the Single Concentration System were adopted, let us see what it would be necessary to do.

First, a diagram of total end shears such as I have prepared for the "Equivalent Uniform Load System" would have to be used; because for end shears on plate girder spans no satisfactory results can be found by either the "Single Concentration System" or any other "equivalent" system of loading.

Second, for moment computations for floor systems and plate girder spans it will be necessary to have a a table or diagram to show how the value of each concentration varies with the span length. Then to find the bending moment at mid-span it would be necessary to apply the formula $M' = \frac{1}{4} C l$ where C is the concentration and l the length of span, and the formula $M'' = \frac{1}{8} w l^2$, where w is the constant car load per lineal foot, then add the two results thus $M = M' + M''$ = total bending moment due to live load. In comparison with this process, that for the "Equivalent Uniform Load System" appears very short. It consists simply in finding from the diagram the value of w', the equivalent

uniform load per lineal foot, and substituting it in the equation

$$M = \frac{1}{8} w' l^2.$$

Now, as far as the floor system and plate girder spans are concerned, does not this verify my statement that the amount of computation required by the "single concentration System" is double that required by the "Equivalent Uniform Load System," even if the value of the concentration were constant?

Again, does it not appear absurd to figure moments by the use of, first, *a variable concentration* and, second, a constant car load, then add the results together, when the final result can be obtained by a single computation using the variable equivalent uniform load per foot given by a diagram?

As for the use of the "Single Concentration Method" for trusses I admit, and have heretofore admitted, that although by no means as accurate as the "Equivalent Uniform Load Method," it is nevertheless good enough for all practical purposes, especially as its errors can, if desired, be all made to be on the side of safety.

But again, why do double work in computation? And this brings me once more to one of the main points on which we differ. You have twice contradicted my statement that the "Equivalent Uniform Load Method" requires only one-half the figuring that the "Single or Double Concentration System" does. I have just proved the correctness of this statement as far as floor systems and plate girder spans are concerned. It therefore remains for me to prove it for trusses. Let us divide trusses into two groups, those with parallel chords and those with broken top chords, and assume for convenience what in general is true, viz., that the panels are of equal length. In the first case the stresses are usually found by formulæ, and in the second case by graphics. Now, in the first case, when the "Single or Double Concentration System" is adopted, the stress in each diagonal, post and chord section must first be calculated by formula for the uniform car load, and afterward also by formula for the concentration, after which the results are to be added together; while, when the "Equivalent Uniform Load System" is used, the stress in each member is found at once by formula using an equivalent uniform load given by diagram instead of the car load employed in the first-mentioned method. Is it not evident that fully twice as much work is involved by the former method as is involved by the latter? Let us take a practical case for example, viz., the digonal in the n' panel of an n panel truss. By the "Single Concentration Method" the stress is found by the formula

$$s = \frac{n' \, (n' + 1)}{2n} w \, 1 \sec \Theta + \frac{n'}{n} C \sec \Theta$$

while by the Equivalent Uniform Load Method it is given by the formula

$$s = \frac{n' \, (n' + 1)}{2n} w' \, 1 \sec \Theta$$

As these formula are standard, there is no need to explain the meaning of the terms.

Now for the case of broken top chords. Using the "Concentrated Load Method," the stresses are first found graphically by one operation for the inclined end posts, and all the chord sections with a uniform car load over the whole span; then also by graphics the stress for each chord member from the concentration, which must occupy a different position for each panel length of either chord; and finally the advancing load web stresses are found graphically for the combined uniform car load and concentration.

In using the "Equivalent Uniform Load Method," the stresses on inclined end posts and all chord sections are found graphically by one operation for an equivalent uniform load over the whole span, and afterwards the advancing load stresses on web members are found graphically by employing the same equivalent uniform load. Now, although in either case the work of computing web stresses may be shortened materially by employing the method of an assumed end reaction, which I proposed in my paper on "Some Disputed Points in Railway Bridge Designing," nevertheless it will be found from actual experience that the shifting of the concentration for each chord section (especially where two concentrations are employed), will add so much to the labor of computation that the total amount of same will be for the "Concentration System" fully twice that required for the "Equivalent Uniform Load System."

In your editorial of July 29 you make a statement which appears to me very curious. You say: "But the evident error lies in the fact that the labor required by a single load computation is to that required by a uniform load, approximately as unity is to the number of panels in the span contemplated." Do you mean to say that in a twenty-panel bridge with a broken top chord it will take twenty times as much labor to compute all the chord and web stresses due to a uniform load per lineal foot as it would to compute all the chord and web stresses due to a single concentrated load which has to be shifted from one panel point to another, not only for each web stress, but also for each chord stress? If you will tackle the actual problem, you will find that the single concentration will involve quite as much figuring as will the uniform load per lineal foot.

In both of your July editorials you place considerable importance upon the fact that cars should precede as well as follow the engines in determining stresses in chord sections, and raise a doubt about my having taken account of this, so I shall now explain in detail my method of computing the equivalent load of any span.

I first find the moment for each chord section by the exact method of wheel concentrations, *but placing cars ahead as well as following the locomotives*, and for each moment thus found I compute the equivalent uniform load, then by the same exact method, but with no cars preceding the locomotives, I calculate the shear on each web member and determine the equivalent load therefrom. Finally, I take the average of the equivalents thus found for all chord and web members of the span as the equivalent uniform load for such span. The effect of considering cars preceding as well as following the locomotives is to give a better agreement for the "Equivalent Uniform Load System" than would have been found by having no cars ahead of the locomotives.

But why quibble over such an unimportant matter? That the whole subject is of no practical importance can be readily seen by an inspection of Table I., on p. 566, *Railroad Gazette*. Look at the errors in chord stresses for all three methods of computation and see how small they are! In "Class Z" the average errors for all the chord sections of all the spans given in that table are only 0.74 per cent. for the "Equivalent Uniform Load Method;" 1.28 per cent. for the "Single Excess Method," and 0.41 per cent. for the "Double Excess Method;" and, what is still more to the point, there is very little variation from these averages, the errors occuring with surprising regularity and uniformity. In "Class U" many of the errors are about twice as great as those for "Class Z," but still very small. Is it not evident, therefore, that, in deciding about the merits of the different systems, chord stresses are out of the question, and consequently that your insinuation that I have ignored the effect of cars preceding as well as following the locomotives would be without force *even if it were true*.

In your editorial of July 8 you say: "We also infer from his present communication that the extra loads for end shears for short spans, which were prescribed in his original paper, are now discarded in favor of a new system of equivalent uniform loads, inasmuch as he says that 'the equivalent loads on my new diagrams belong to all spans from 10 ft. upward.'"

The changes in this particular which I have made since writing my original paper are simply the adding of certain very heavy alternative axle loadings to my proposed standard, and the plotting of the exact end shears on a diagram instead of indicating them approximately by a rather awkward formula. I am a firm believer in the principle that a change in the right direction is always in order, and am only too glad to receive from other engineers suggestions which will effect improvements in my work.

In conclusion, I desire to say a few words on the closing remark of your last editorial, viz.: "Finally, the wholesale interpolations between the Classes 'Z' and 'U' do not seem to us to be the best way of getting close values for such a wide range of computations, although we do not suppose the resulting errors are very great."

This is "the most unkind cut of all." You have never even seen my curves, and you have not investigated at all concerning the exactness of the interpolation. When I tell you that Mr. Hedrick and I checked and counterchecked the results of the interpolation without finding any error which would be appreciable on the diagram you will understand that this adverse criticism was uncalled for.

The Lake Street Elevated Railroad of Chicago.

It is probable that some time during September the Lake Street Elevated Railroad of Chicago will be opened for traffic. At this writing, the structure, excepting the stations, is completed from the river west to Rockwell street, at the crossing of the Pan'Handle tracks. The stations are being built as rapidly as possible and they will probably be ready by the time the bridge across the river and the Market street terminus are completed. The structural work is practically completed from Market street, on the east side of the river, to a point several blocks west of Rockwell street, so that at the opening about three miles will be ready for operating.

The bridge that was built about seven or eight years ago to carry the Lake street traffic across the river will, with but few changes, carry the trains of the elevated road. Electricity has been substituted for turning the bridge, and the old power house that is on top of the bridge, above the roadways, will be removed to make way for the elevated road. The bridge has been strengthened somewhat and knees riveted to the compression members of the trusses carry the girders for the road. For the present, the eastern terminus will be at Market street, just east of the river.

From the river to Rockwell street the foundations for the columns are at the curb lines, and the cross girders extend the full width of the street. This gives room for four tracks, although at present only two are built, and these in the middle. From Rockwell street west the foundations are in the street, and the structure is somewhat narrower. Three tracks are being laid on that part, the third and the middle one, to be used for storing cars until the line is completed out to where the yards are to be, near Fortieth or Forty-third street. At Rockwell street is the incline on which are raised the rolling stock and fuel.

In securing the guard timbers and ties to the longitudinal girders, Mr. Alberger, the General Manager, has placed the outside guard timbers 4 in. farther from the rail than is usual, and the bolt that fastens the timber to the tie is a hook bolt that hooks over the flange of the girder. The inside guard timber is fastened to the ties with lag screws. The rails used are 76 lbs. to the yard and of a special section having a wide base and large head and standing but 4½ in. high.

The design of the stations is the same as for those of the Manhattan Elevated of New York, having entrance and exit stairs at each of the four corners of the streets, two for eastbound trains and the same number for trains westbound. The arrangement of ticket office, ticket chopper and entrance to and exit from the train platforms are the same as the Manhattan. The framing of all stations is of iron. The stations and platforms are wired for electric lights.

The locomotives were illustrated in the *Railroad Gazette* of Aug. 4 and 11, 1893. The following are some further facts: The tender truck wheels are the Brunswick cast steel with steel tires; the frame under the tender is made of 1½ in. slab; the equalizers over the back drivers have double coiled springs under the back ends; the crossheads are of cast steel and the guides of the Laird type. The attachments in the cab are quite conveniently arranged; the discs indicating the destination are placed in the roof of the cab, as in the Manhattan engines, where they are conveniently operated by either the engineer or fireman. The steam-heating pipes are arranged for the Morton system, with the Mason regulating valve. The lubricator used is the Nathan triple, sight feed, the third feed lubricating the ejector feed valve. Two Monitor injectors are used on each engine; they are No. 5, made especially for elevated railroad service. The side doors of the cab are sliding doors and those in the end are hinged and open outward. The cylinder cocks are of a special design patented by Mr. Frank Hedley, Superintendent of Motive Power. Ten engines have been built and received in Chicago, of which five are simple and five are compound. Another order for 15 compounds has recently been given to the Rhode Island Locomotive Works. The 15 are to be duplicates of the five compounds.

The cars were built by the Gilbert Car Manufacturing Company, of Troy, N. Y. The interior of the cars is plain, there are no carved panels, but the cars are well finished. The woodwork of the sides and seats is finished in mahogany and the ceiling in light-colored veneering. The windows are wider than usual in such cars and the window posts are placed between the seats, where the seats extend lengthwise of the car, so that they do not interfere with the hats of persons occupying the seats. The doors are single and sliding. The cars are provided with apparatus for lighting with Pintsch gas, and each car has four oil lamps arranged on the sides of the car, to be used in case the supply of gas gives out. The bottom member of the car transom is 6 × 1½ in., and the two members are welded together at the outer ends. The vacuum brake is used on all equipment, cars and locomotives.

The Lake Street elevated has had a stormy passage ever since the first company was organized in 1886, but there can be no question now about its success, so far as opening the road for traffic is concerned.

The Society for the Promotion of Engineering Education.

The Educational Section of the World's Engineering Congress at Chicago brought together some 75 of the leading teachers in the engineering schools of America as well as several from abroad. The proceedings were valuable to all who participated and of such interest as to hold the members of this division exclusively to the business brought before it, notwithstanding the strong counter attractions in the six other sections. So important appeared this meeting to all who attended its sessions that there was a universal desire to continue the work so well begun. The teachers of mechanical engineering already had an organization of their own which they proposed to enlarge to include all those engaged in engineering education, but after some discussion it was deemed best to begin anew and create a somewhat different organization.

A constitution and rules have been adopted and there is now a prospect that if all those interested in engineering education in America will give to this new society the weight of their influence, and will contribute what they can to its work, that the engineering schools of this country will soon be regarded by all, as some of them are thought to be now in fact, the best schools of engineering in the world.

The following members were chosen as members of the Council of the new Society and their terms of office were afterwards determined by lot.

M. E. Cooley, Prof. Mech. Eng., University of Michigan, Ann Arbor, Mich.

H. T. Eddy, Pres. Rose Polytechnic Institute, Terre Haute, Ind.

W. F. M. Goss, Prof. Mech. Eng., Purdue University, Lafayette, Ind.

W. R. Hoag, Prof. Civ. Eng., University af Minnesota, Minneapolis, Minn.

S. W. Robinson, Prof. Mech. Eng., Ohio State University, Columbus, O.

H. W. Spangler, Prof. Mech. Eng., University of Pennsylvania, Philadelphia, Pa.

Robert H. Thurston, Director of Sibley College, Cornel University, Ithaca, N. Y.

H. T. Bovey, Prof. Civ. Eng., McGill University, Montreal.

Wm. H. Burr, Prof. Civ. Eng., Columbia College, New York.

O. H. Landreth, Prof. Civ. Eng., Vanderbilt University, Nashville, Tenn.

Mansfield Merriman, Prof. Civ. Eng., Lehigh University, Bethlehem, Pa.

Wm. G. Raymond, Prof. R. R. Eng. and Geodesy, Rensselaer Polytechnic Institute, Troy, N. Y.

G. F. Swain, Prof. Civ. Eng., Massachusetts Institute of Technology, Boston, Mass.

De Volson Wood, Prof. Applied Mechanics, Stevens Institute of Technology, Hoboken, N. J.

I. O. Baker, Prof. Civ. Eng., University of Illinois, Champaign, Ill.

Storm Bull, Prof. Mech. Eng., University of Wisconsin, Madison, Wis.

S. B. Christie, Prof. Mining Engineering, University of California, Berkeley, Cal.

J. Gailbraith, Prof. of Engineering, Queen's College, Toronto, Canada.

J. B. Johnson, Prof. Civ. Eng., Washington University, St. Louis, Mo.

F. O. Marvin, Prof. Civ. Eng., University of Kansas, Lawrence, Kan.

C. D. Marx, Prof. Civ. Eng., Leland Stanford, Jr., University, Palo Alto, Cal.

The following officers were elected for the ensuing year (to hold till the annual meeting in August, 1894):

President: De Volson Wood, Stevens Institute of Technology, Hoboken, N. J.

Vice-Presidents: S. B. Christie, University of California, Berkeley, Cal.; Geo. F. Swain, Massachusetts Institute of Technology, Boston, Mass.

Secretary: J. B. Johnson, Washington University, St. Louis, Mo.

Treasurer: Storm Bull, University of Wisconsin, Madison, Wis.

It is probable that the Council will be enlarged at the next annual meeting. No professors of electrical engineering were placed on the Council because none were in attendance. The intention was to embrace all kinds of engineering instruction. Graduates of engineering schools, not engaged in teaching, can become members by having their names brought before the Council. This Society will publish the papers presented to the educational section of the World's Engineering Congress, as their first volume of proceedings. These papers, with an abstract of the discussions, will make a volume of about 150 to 200 pages.

The La Burt Automatic Coupler.

The accompanying illustrations show quite clearly the general appearance and details of construction of the La Burt, automatic, vertical plane coupler. This coupler is made up of five parts: the drawhead, knuckle, locking block, lifting link, and pivot pin. Of these parts, the knuckle and pivot pin are of steel, and all other parts of malleable iron. The locking block, shown in fig. 5, is loosely pivoted at one end, while the opposite or free end bears against the tail of the knuckle. The pin on which the end of the locking block is pivoted does not take the thrust transmitted from the tail of the coupler, but merely serves to hold the block in place, the wall of the cavity in which the block is placed providing the necessary bearing. The hanging of the block is such as to produce a wedging action against the tail of the knuckle, and serves to keep the knuckles always tightly locked when closed. It is claimed that by reason of this wedging action the force required to lift the block is much reduced. The unlocking or lifting of this block is accomplished by means of a short link, fig. 6, passing up through the wall of the coupler, just ahead of the buffer stop, and connected at its lower end with a locking block near its free end. The upper end is provided with an eye to which the coupler unlocking device is to be connected. To provide for the automatic opening of the knuckle, the under side of the head of the knuckle pin, fig. 7, is made to bear on a spiral upon the upper side of the head, and the knuckle is so keyed to the pivot pin that it will rise and fall with the pin. It is claimed that by the use of the wedge lock the coupler can be unlocked under a greater strain than would otherwise be possible, thus making the unlocking of a coupler in case it should pull out much more probable than with the use of any other form of lock, and also that its simplicity renders it quite unlikely to get out of order.

The coupler is made to conform to the Master Car Builders' standards and is interchangeable in all respects with others of the vertical plane type. Some of the advantages claimed for the coupler are: Positive automatic opening of the knuckle by gravity, a positive gravity lock without the use of springs, little force required to close the knuckle, strong and durable construction, and simplicity of parts.

The general offices of the La Burt Automatic Electric Block Signal System and Car Coupler Company are at 203 Broadway, New York.

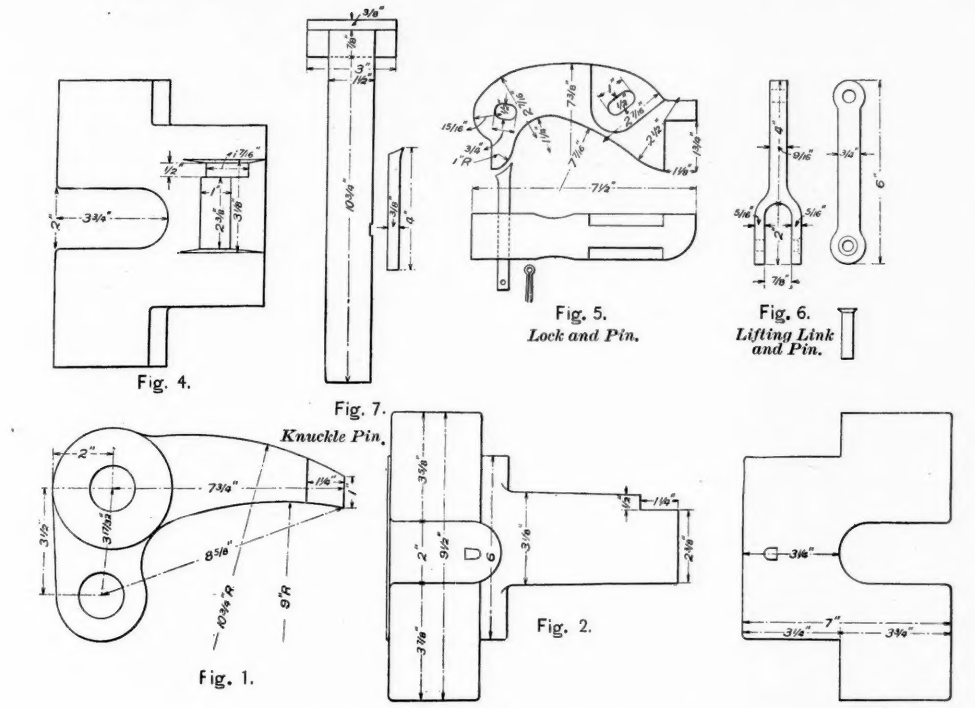


Fig. 4. Fig. 7. *Knuckle Pin.* Fig. 5. *Lock and Pin.* Fig. 6. *Lifting Link and Pin.* Fig. 1. Fig. 2. Fig. 3.

Details of Knuckle, Lo,ck Lifting Link and Pin.

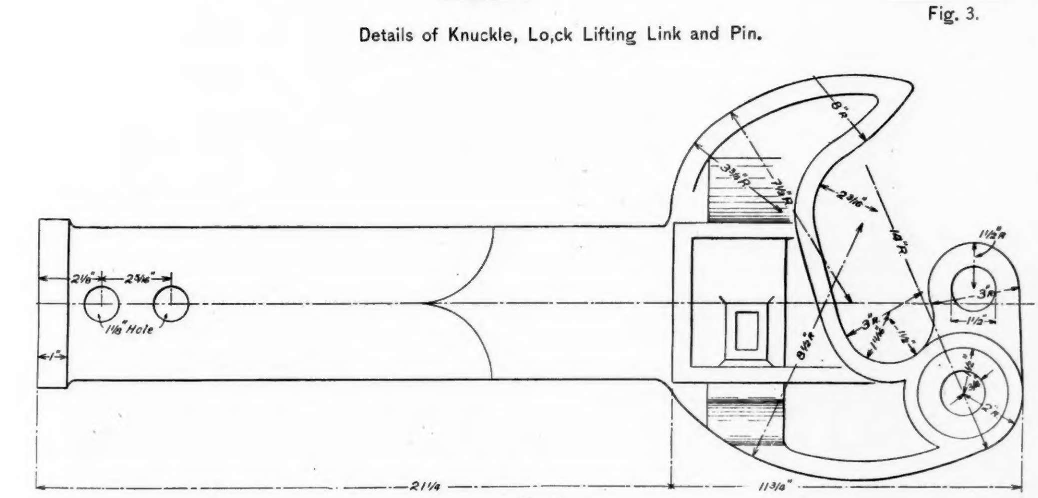
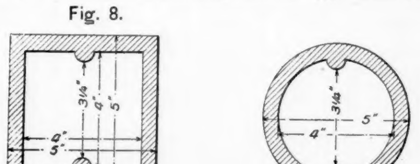


Fig. 8.



Section 1" back of head. *Section 12" back of head.*

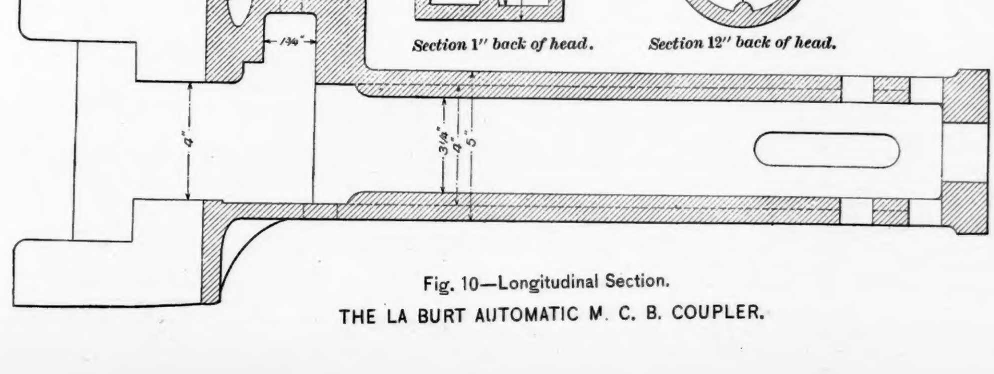


Fig. 10—Longitudinal Section.

THE LA BURT AUTOMATIC M. C. B. COUPLER.

Tests of the Locomotive at the Laboratory at Purdue University.

We give below an abstract of a paper read at the Engineering Congress, Division B, Mechanical Engineering, by Prof. W. F. M. Goss, of Purdue University, on tests made during the past year with the laboratory locomotive. The extensive and very complete table given is here considerably reduced, leaving only the data necessary for a clear idea of the scope and results of the work:

A year ago there was presented to this Society a description of the plan of mounting a locomotive, then but recently added to the equipment of the Engineering Laboratory of Purdue University. The present paper gives the results of twenty tests of this engine, made during the last school year

While the description already referred to makes unnecessary at this time a detailed account of the accessory mechanism, it may be well to state that the locomotive is mounted with its drivers upon supporting wheels which are carried by shafts turning in fixed bearings, thus allowing the engine to be run without changing its position as a whole. Load is supplied by four friction brakes fitted to the supporting shafts, and offering resistance to the turning of the supporting wheels. Traction is measured by a dynamometer attached to the drawbar. The boiler is fired in the usual way, and an exhaust blower above the engine, but not in pipe connection with it, carries off all that may be given out at the stack. . . .

The behavior of the Alden friction brakes which serve to load the engine cannot fail to be interesting. While it is true that none of the tests reported show the engine under its maximum load, enough has been done to prove the brakes fully able to absorb all the work that the locomotive can do, whether it be run at high or low speed.

The balancing of the locomotive is doubtless more than ordinarily good. Early trials showed that below 80 revolutions per minute the lever dynamometer satisfactorily transmitted the stress in the drawbar without the intervention of a dash-pot, but that any considerable increase above this limit resulted in an unsteady motion, there being at certain speeds a time vibration which was not easily controlled. A 10-in. dash-pot was first attached to the main lever of the dynamometer at such a point as would make it possible for the dash-pot to receive a stress equivalent to about one-sixth of that in the drawbar. This addition required a correction of 209 pounds to be added to the value of the weights upon the scale-pan, to give the correct drawbar stress. This dash-pot was in use during all of the tests herein reported. For the later tests a similar dash-pot was placed in a horizontal position between the framework behind the locomotive and a bracket attached to the under side of the foot-plate. This dash-pot has no connection with the dynamometer. These devices have made it possible to run at speeds as high as 300 revolutions with a very small longitudinal movement of the engine. The matter of more perfectly balancing the engine is now receiving attention.

The principal dimensions of the locomotive are as follows.

Total weight (makers' figures)	85,000 lbs.
Weight on four drivers (makers' figures)	56,000 lbs.
Total wheel base	22 ft. 11 in.
Driving-wheel base	8 ft. 6 in.
Cylinders:	
Diameter	17 in.
Stroke	24 in.
Ports:	
Length	16 in.
Width of steam ports	1¼ in.
" " exhaust port	2½ in.
Richardson balanced valves:	
Maximum travel	6.53 in.
Outside lap	¾ in.
Inside lap	1/32 in.
Piston displacement, cubic feet:	
Right side — Head end	3.1525
Right side — Crank end	3.0540
Left side — Head end	3.1525
Left side — Crank end	3.0540
Clearance, per cent of piston displacement:	
Right side — Head end	9.390
Right side — Crank end	10.265
Left side — Head end	9 980
Left side — Crank end	10.019
Indicated horse-power constants:	
Right side — Head end	.01375
Right side — Crank end	.01332
Left side — Head end	.01375
Left side — Crank end	.01332
Drivers:	
Nominal diameter	63.
Actual circumference at beginning of tests	197.25
" diameter " " "	62.786
Boiler:	
Diameter, waist at front end	52.
" tubes	2.
Number of tubes	200
Width of firebox	34.5
Length "	72
Total heating surface, square feet	1,214.4
Grate surface	17.5
Pounds of water in boiler when filled to middle gauge	8.450
Steam space in boiler when filled to middle, gauge cubic feet	52.8
Ratio of steam space to entire cubical capacity of boiler	.29
Exhaust nozzles (double), diameter	3.

A section of the valve and its seat is shown by fig. 11.

The quadrant of the reversing lever has 31 equally

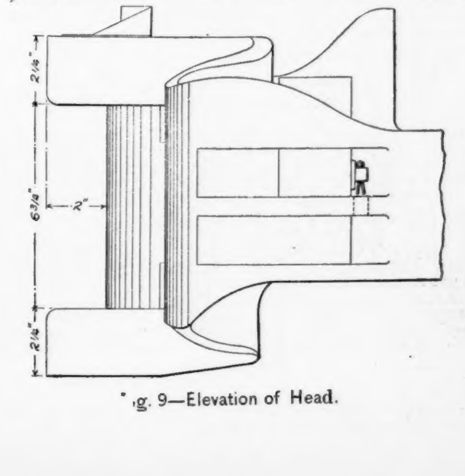


Fig. 9—Elevation of Head.

spaced notches, 15 on each side of the centre. The diagram (fig. 2) shows the valve action for forward motion. The curves representing the valve travel and port opening are plotted from points obtained from the motion of the left valve-spindle while the engine was under steam. The curves representing the events of the stroke show the average of the events for the four-cylinder ends.

Observers were stationed for each test as follows:

Station.	Number of observers.
To keep running log, time and gong	1
To weigh fuel; also to note time of starting and stopping injector, and to keep log of same	2
To weigh feed water, to observe temperature, and to keep log of same	2
To operate indicators; also to take calorimeter readings, dry-pipe pressure, draught gauge and pyrometer readings	4
To read engine and supporting-wheel counters; also to take boiler pressure, and the water pressure upon the several brakes	2
To occupy the engineer's box	1
Total number of observers	12

Besides these, there were a supervisor of tests, a fireman and three regular attendants of the laboratory who gave attention to the mounting and accessory machinery.

Blanks for data were used in each test as follows:

A fuel log, upon which are arranged several series of four columns each, in which columns are entered (1) the weight of each filled box of coal, (2) the weight of the emptied box, (3) the difference or the weight of coal, and (4) a time check by means of which may be seen the weight delivered in each 10-minute interval; a feed-water log similar in form to that of the fuel log, and showing the weight and number of barrels of water delivered in equal intervals of time, also showing the temperature of the water at the time of each gong, the latter entry serving as a time check; a calorimeter log, arranged for the data necessary to the determination of the quality of steam; a running log, providing for the number and time of gong, revolution of drivers, difference of same, steam pressures, dynamometer reading, water pressure upon brakes, draft, temperature of smokebox, and any other observed data not otherwise provided for; a prepared blank upon which are recorded pressures from indicator cards in columns of four groups, one for each end of each cylinder; and a summary sheet, containing the general constants for the locomotive, and the constants for the test, and receiving, as the test is worked up, the final summarized results from all of the sub-logs, and, finally, all calculated results which may be derived from observed data; hence this sheet constitutes a complete summary of the test.

In preparation for a test the engine was usually run under a light load and at a low speed for an hour or more in the morning. After the noon stop, it was started again with a light fire, the reverse lever being at once brought to the position it was to occupy during the test. The load and speed were gradually increased until the conditions for the anticipated test were reached. The ash-pan was then cleared, and upon the stroke of the gong, from ten to thirty minutes after starting, all observations were taken and the test was considered as commenced. The observations were repeated at 10-minute intervals. Throughout the test it was the purpose to maintain all conditions as nearly as possible constant. If, at the end of the first or second 10-minute interval, the speed was found to be a little too far from that desired, the throttle was moved slightly. Aside from this adjustment early in the test, and changes due to small vibrations of steam pressure, there was no perceptible charge of condition.

The tests were ended as they were begun; that is, upon the stroke of the gong, care being taken to have the water at the starting levels and to see that the fireman took no advantage of the anticipated stop. The weight of coal upon the grate at the end of the test was assumed to be the same as that upon the grate when the test was begun. Within a few seconds after the last gong, the engine was stopped and the fire immediately dumped and quenched.

The speed was determined by means of a registering counter attached to the rear driver. Recently there has been added a Boyer railway speed recorder.

There were no losses of steam from the boiler excepting by the calorimeter, and, though this amount is very small, the weight of steam supplied to the engine has been corrected for it. Loss from the injector overflow for a few of the early tests was estimated from weights obtained upon repeated trials. In the later tests all water passing the overflow was drained to a barrel and gauged.

The coal used was Brazil (Ind.) block,* which burns freely and without clinker. An analysis gave the following results:

	Per cent.
Moisture	13.05
Combustible volatile matter	32.34
Fixed carbon	48.78
Ash	5.81
Total	99.98

The coal was broken into small lumps and shoveled into a weighing box of 275 or 300 pounds capacity. From the box it was dumped as needed within easy reach of the fireman. It was found impossible to obtain equally dry coal for all tests; hence, in the course of a test, a fair sample of about 50 lbs. was carefully weighed in a galvanized iron bucket and dried until it would give off dust when shaken; it was then reweighed and its loss determined. The weight of all the coal used for a test was corrected in the same proportion. The correction was always small, averaging not much more than one per cent.

Draft was measured by a U-tube attached to the wall of the laboratory and connected with the smokebox by a small pipe.

Data concerning smokebox temperature were sought, in the early tests, by use of a metallic pyrometer. A new instrument from a reliable maker, having a stem 48 in. long, was set horizontally across the centre of the smokebox, about 5 in. in front of the tube sheet. Its indication for the first test was probably not far from correct, but when the boiler had cooled off, its indications for the lower temperature were more than 150 deg. too high. Repeated trials showed that it was impossible to get a correction for it which would hold good through two successive tests, and its further use was abandoned. Resort was then had to a copper-ball calorimeter which had been used in previous tests, the particular arrangement of which may be described as follows: A piece of 1-in. steam pipe threaded at one end is screwed through the shell from the inside of the smokebox. It is set radially about 4 in. from the front tube sheet, and inclines from the centre of the smokebox downward. The threaded end passes through the shell a sufficient distance to receive a cap. The cap serves to close the end of the pipe, and also to carry a light rod, to the opposite end of which is attached a simple piston fitting loosely to the bore of the pipe. A copper ball ¾ in. in diameter, and a copper vessel suitably inclosed to prevent radiation, complete the outfit. In using the apparatus, the copper ball is inserted in the bore of the pipe, the piston applied below it, and both are pushed up the pipe until the cap at the lower extremity of the piston-rod meets the lower end of the pipe. The cap is then screwed in place, closing the pipe and retaining the ball at the centre of the smokebox. Here it is allowed to remain from 40 to 60 minutes, after which time it is assumed to have come to the temperature of the smokebox. The cap is then unscrewed and the pistons quickly withdrawn, allowing the ball to roll down the pipe into the water contained in the copper vessel. From the known weight of the ball, the water, and the copper vessel, and from observed changes of temperature, the original temperature of the ball is calculated. The average result of three such determinations was assumed to be the temperature of the smokebox for the test. Using the data thus obtained for eleven tests, not all of which are among those reported, a curve has been plotted with the draft as ordinates and the smokebox temperature as abscissæ (fig. 3), and from this curve the temperature has been determined for the tests where no direct experiments were made. These assumed temperatures are marked with a star in the tabulated data.

The actual and the equivalent evaporation per pound of coal are given in their proper place. These factors vary considerably, and it has seemed desirable to take advantage of the large number of tests in obtaining mean results. It may be assumed that, other things being equal, the evaporation depends upon the draft. Thus, in the diagram shown by fig. 4 may be seen points representing the evaporation from and at 212 degs., for each test, plotted in terms of the draft. A smooth curve drawn through these points will serve to show the assumed evaporation for any test when its draft is known. This assumed evaporation has been found for each of the tests reported, and the result is presented in the table.

The drawbar stress was practically constant during each test, the mechanism of the dynamometer automatically regulating the load upon the brakes. The construction is such that any movement of the dynamometer lever from its central position is met in the brakes by a change of water pressure which operates to restore the lever.

The speed for all tests was controlled by the throttle, which, as previously stated, was rarely moved during the progress of a test. If the steam pressure changed, there was a corresponding change in the speed, but the fluctuations of pressure were slight.

The mean effective pressure varied with the accelerations of speed, and somewhat because of the reduced friction of the engine itself as the test proceeded. During all but the very light power test, the injector was constantly in action and the amount of water and coal weighed out during each 10-minute interval was nearly the same. No steam was ever lost from the safety valve during a test.

Tests at light load and low speed were of three hours duration; those of heavier load and higher speed were somewhat shorter. The shortest consumed two hours.

It is obvious that, where the conditions are maintained as nearly as constant as those which have been described, the principal gain in prolonging the test is in diminishing the effect of errors in stopping and starting. For a locomotive the totals of steam and water consumed are enormous when compared with similar factors for a stationary boiler plant of like dimensions. In determining the steam consumption the error incident to starting and stopping probably does not in any of the tests reported exceed one per cent., so that little would have been gained by making the tests longer. The record of fuel consumption is subject to greater error than that of steam consumption, but the repetition of tests giving draft conditions nearly similar, permits a comparison of results which must lead to the detection of error in individual tests, as has been already shown.

Test No. 20 was run with a drawbar stress of 6,200 lbs. and at the same speed and cut-off with No. 17. This test was witnessed by Messrs. William Forsyth, James E. Denton, D. L. Barnes and A. S. Vogt, from the Society's Committee on "Standard Methods of Locomotive Testing," and also by Mr. C. H. Quereau, member of the society.

The per cent. of steam which is accounted for by the indicator for all tests is large. For tests at short cut-off, this doubtless is due to the early compression; and for tests at longer cut-off, to the relatively low range of cylinder temperature and to the superheating of the steam at the pressure at which it is supplied to the engine. Thus, as the cut-off is increased the effect of compression is diminished, but this loss of effect is more than compensated for by the action of the throttle in reducing the initial pressure of the steam and thereby increasing its dryness, and in some cases in superheating it.

This statement will also serve, in part, to explain the small difference between the amount of steam shown at cut-off and that shown at release. For the shortest cut-off there is a little re-evaporation; the amount decreases as the cut-off is lengthened, until it disappears and condensation occurs. The change in all cases is slight. Change of speed does not affect, materially, the cylinder condensation.

The record of steam consumption will be reassuring to those who have so long kept their faith in the much-maligned locomotive. It is clear that when given a fair chance, its performance will compare favorably with that of any non-condensing single-expansion engine. The best record shown is that of 30,608 B. T. U., or 24.97 lbs. of steam per horse-power per hour, obtained from test No. 16. This test gives also 33.53 foot-tons of work at the drawbar for each pound of steam, or 197.15 foot-tons per pound of coal. Curves showing steam consumption for the several series are given in fig. 6.

With 2,600 lbs. drawbar stress, when the speed is increased from 15 miles to 24 miles, there is a decided gain in the steam consumption per horse-power per hour, though the per cent. of steam shown by the indicator is slightly less at the higher speed. With 5,200 lbs. drawbar stress, when the speed is increased, there is also gain, though less than in the previous case, and under these latter conditions the steam accounted for by the indicator is higher for the tests showing the greater economy.

A comparison of tests made with the same speed and cut-off, but with a difference in load, will show how the performance suffers from the effect of an underload.

* An exception in the use of this coal is to be made in case of Test No. 14. This test was made at a time when block coal could not be obtained, and it was, therefore, run with Brazil lump coal. The deductions based upon fuel consumption are omitted for this test.

TABULATION OF RESULTS OF PURDUE UNIVERSITY LOCOMOTIVE TESTS.

Number of test.	Duration of test, minutes.	Speed in revolutions per minute.	Average cut-off in per cent. of stroke	Average release in per cent. of stroke.	Average compression in per cent. of stroke.	Pressures above atmosphere. Boiler.	Dry-pipe.	Average initial.	Average at cut-off.	Average at release.	Average at compression.	Average M. E. P.	Total I. H. P.
1	180	81.60	18.62	66.60	53.32	128.9	104.4	100.8	85.7	22.1	1.6	29.0	128.38
2	180	79.30	26.92	72.25	42.72	129.8	76.0	76.1	61.2	18.5	1.6	28.0	128.47
3	180	80.59	36.27	77.20	34.57	126.8	62.0	62.1	48 9	19.2	1.8	29.4	128.09
4	180	79.18	46.70	81.82	28.05	125.5	48.6	47.8	39.6	18.4	1.9	27.5	117.75
5	180	79.80	55.52	85.47	21.82	128.7	43.0	42.7	36.2	19.6	1.8	28.5	124.30
6	180	80.02	77.32	94.15	9.05	129.7	32.1	31.9	29.9	21.6	1.9	27 3	118.21
7	180	127.37	18.62	66.60	53.32	128.4	117.8	109.8	84.1	23.6	2.5	31.0	212.37
8	180	128.35	26.92	72.25	42.72	129.6	89.0	86.8	65.0	19.5	2.6	29.9	205 70
9	180	128.47	36.27	77.20	34.57	130.3	70.0	69.7	52.4	20.2	3.3	30.2	209.93
10	180	128.77	46.70	81.81	28.15	130.3	58.9	58.9	43.5	20.5	3.3	31.6	220.61
11	180	128.14	55.52	85.47	21.82	127.7	48.0	47.5	36.8	19.7	3.0	29.5	205.31
12	180	128.15	77.32	94.15	9.05	129.7	33.9	32.9	29.5	21.3	2.8	27.2	188.51
13	180	78.20	26.92	72 25	42.72	130.0	126.1	117.6	100.5	36.3	2.1	52.6	222.90
14	180	76.42	36.27	77.20	34.57	129.6	97.3	97.9	80.1	33.4	2.0	51 5	224.85
15	180	81.13	46.70	81.82	28.05	130.4	89.21	88.5	72.6	37.7	2.3	56.2	244.56
16	140	136.04	36.27	77.20	34.57	129.3	118.0	111.5	85.2	36.3	4.9	54.2	399.48
17	140	130.40	46.70	81.82	28.05	130.2	105.3	100.1	77.3	40.0	4.4	58.4	412.23
18	140	131.50	55.52	85.47	21.82	128.0	91.0	86.8	68.6	41.1	4.7	57.9	412.28
19	120	129.37	77.32	88.32	17.77	123.0	79.3	77.8	64.7	42.3	4.8	56.0	392.51
20	120	127.90	46.70	81.82	28.05	124.0	114.0	111.8	87.7	46.6	5.1	65.4	453.16

Number of test.	Fuel. Pounds of dry coal.	Pounds of dry ash.	Pounds of coal minus pounds of ash.	Pounds of coal per indicated horse-power per hour.	Pounds of coal per foot of grate surface per hour.	Draft in inches of water.	Indicated horse-power per foot of grate surface.	Temperature in smokebox, degrees F.	Water and steam. Pounds of steam supplied engine.	Pounds of water per pound of coal.	Equivalent evaporation from and at 212°.	Pounds of steam supplied engine, per revolution, by tank.	Pounds of steam supplied engine by tank, per indicated horse-power per hour.
1	1,833	373	1,460	4 76	39.91	0.86	7.34	590*	11,671	6.49	7.86	0.7942	30.24
2	1,659	182	1,477	4 64	31.60	0.76	6.88	585*	10,903	6.67	8.10	0 7630	30.13
3	1,598	303	1.295	4.69	34.32	0.85	6.31	589*	12.018	6.74	7.90	0.8280	31.28
4	1,910	177	1,733	5.40	36.37	0.77	6.72	586*	12,513	6.61	7.97	0.8770	35.40
5	2,245	298	1,947	6.02	42.76	0.97	7.10	595*	13.677	6.13	7.40	0.9520	36.67
6	2,631	180	2.451	7.42	50.11	1.32	6.75	609*	16,695	6.37	7.71	1.1590	47.07
7	2,699	274	2,625	4.23	51.41	1.35	12.13	615	18,456	6.42	8.31	0.8051	28.97
8	2,838	384	2,454	4.57	54.06	1.34	11.75	612*	18,007	6.41	7.61	0.7790	29.18
9	3,014	316	2,698	4.79	57.46	1.39	11.99	617*	19,102	6.34	7.63	0.8269	30.33
10	3,305	310	2.985	5.00	62.94	1.58	12.60	622*	20,888	6.36	7.40	0.9011	31.56
11	3,287	270	3,017	5.34	62.61	1.73	11.73	628*	22,826	6 98	8.13	0.9896	37.06
12	4,193	371	3,822	7.40	79.84	2.18	10.77	655*	25,233	6.04	7.23	1.0939	44.62
13	2.491	310	2,181	3.73	47 45	1.80	12.73	635*	17,898	7.29	8.78	1.2714	26.77
14	2,893	603	2,290	....	.....	1.87	12.85	637*	18,890	....	....	1.3648	29.48
15	3.368	277	3,091	4.59	64.14	2.00	13.96	648	21,828	6.54	7.87	1.4440	30.04
16	4,633	402	4,231	4.99	113.46	3.34	22.74	710	24,277	5.28	6.35	1.2740	24.97
17	4,847	273	4,574	5.04	118.71	3.56	23.56	760	26,516	5.50	6.60	1.4523	27.57
18	5,278	313	4,965	5.49	129.26	3.80	23.56	792	28.444	5.44	6 57	1.5500	29.62
19	5,132	308	4,824	6.68	146.62	4.30	21.92	825*	25,185	4.92	5.89	1.6222	32.08
20	4,979	439	4,540	5.49	142.0[illegible]	4.70	25.90	787	25,638	5.18	6.26	1.6705	28.29

Number of test.	Pounds of steam by indicator, per revolution. At cut-off.	At release.	At beginning of compression.	Re evaporation per revolution.	Condensation per revolution.	Dynamometer record. Tractive horse-power.	Friction of engine in horse-power.	Friction of engine, per cent. of indicated horse-power.	Dynamometer work in foot tons, per pound of steam by tank.	Dynamometer work in foot tons per pound of dry coal.	Assumed performance. Equivalent evaporation from and at 212°.	Pounds of coal per indicated horse-power per hour.	Dynamometer work in foot tons per pound of coal.
1	.78000	.84438	.32136	.0643	0	106.03	22.35	17.41	26.90	171.3	7.90	4.73	172.2
2	.80020	.86190	.26571	.0617	0	103.05	17.43	14.47	28.07	185.1	8.00	4.59	182.8
3	.86275	.88998	.23096	.0272	0	104.72	23.37	18.24	25.82	172.4	7.89	4.84	172.2
4	.91168	.91665	.19597	.0049	0	102.89	14.86	12.62	24.38	159.8	7.99	5.39	160.2
5	.97355	.98298	.16631	.0094	0	103.70	20.60	16.57	22.45	132.0	7.85	5.68	140.0
6	1.15417	1.13489	.09705	0	0.0193	103.96	14.25	12.05	18.49	117.4	7.11	8.04	108.3
7	.83191	.86048	.33618	.0285	0	165.51	46.85	22.06	26.63	182.1	7.57	4.65	165.9
8	.83913	.84727	.28412	.0081	0	166.79	38.91	18.92	27.50	174.5	7.58	4.68	173.8
9	.89516	.90790	.25085	.0125	0	166 95	42.97	20.47	25.96	164.5	7.53	4.77	162.3
10	.96084	.96773	.21147	.0069	0	167.44	53.17	24.10	23.58	150.0	7.42	5 11	150.4
11	.98911	.98165	.17784	0	0.0045	166.52	38.79	18.89	21.67	150.4	7.34	6.10	135.8
12	1.13941	1.12007	.10438	0	0.0193	166.59	21.97	11.65	19.64	117.9	7.13	7.55	116.3
13	1.18453	1.19570	.28983	.0111	0	200.83	22.08	9 89	33.33	239.4	7.32	4.47	199.7
14	1.23708	1.24047	.23202	.0034	0	209.28	15.56	6.92	31.52	223.9	....	....	.....
15	1.40543	1.40506	.19521	0	0.0004	210.50	34.06	13.92	28.64	185.6	7.10	5 14	167.4
16	1.29160	1.30440	.26754	.0068	0	353.90	44.09	11.08	33.53	197.1	6.67	5.98	207.0
17	1.47300	1.46170	.22321	0	0.0113	338.36	73.87	17.92	29.47	161.2	6.60	5.06	161.2
18	1.55220	1.55110	.19233	0	.0011	341.19	71.09	16.90	27.60	149.0	6.53	5.51	147.9
19	1.63329	1.63310	.16649	0	.0036	335.67	56.84	14.82	26.37	129.6	6.35	6.07	139.7
20	1.61189	1.74216	.22670	.1303	0	395.00	57.62	12.70	30.24	156.6	6.24	5.50	156.1

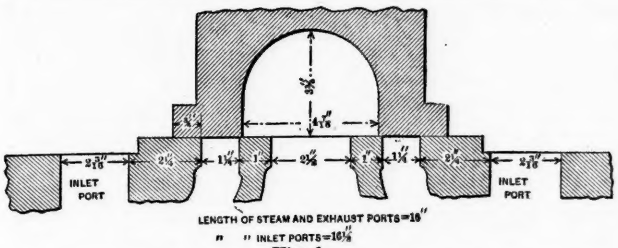


Fig.1.

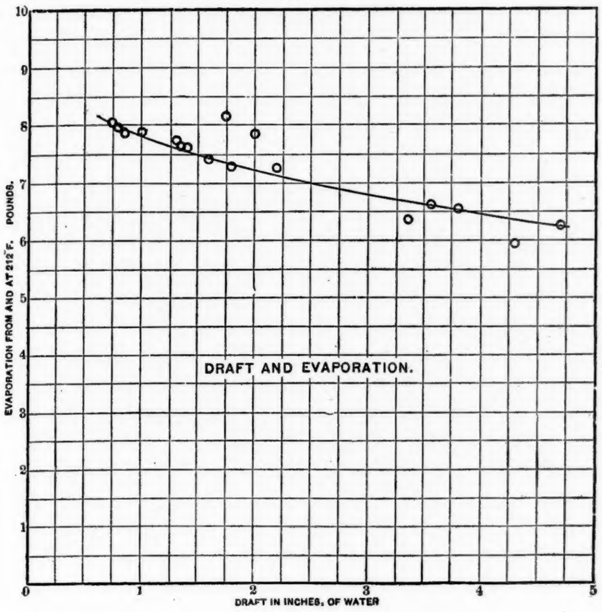


Fig. 4.

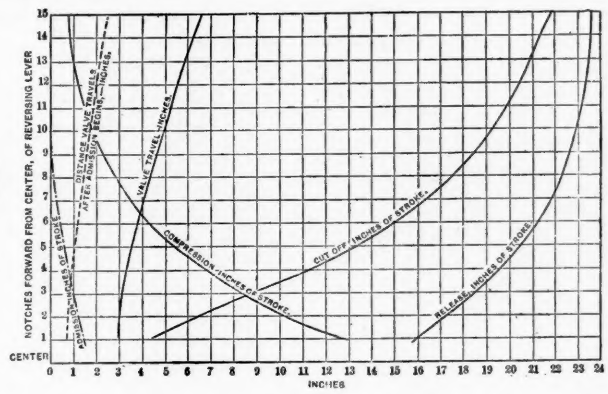


Fig. 2.

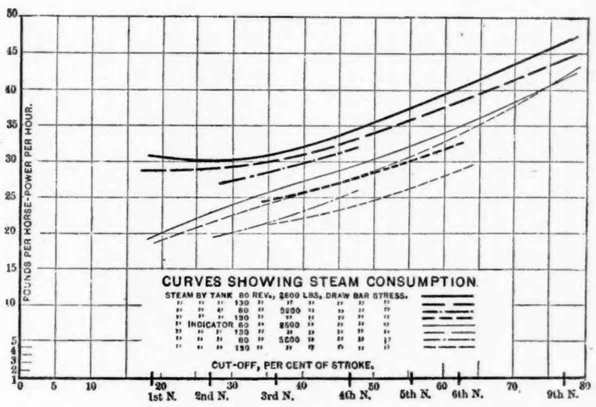


Fig. 6.

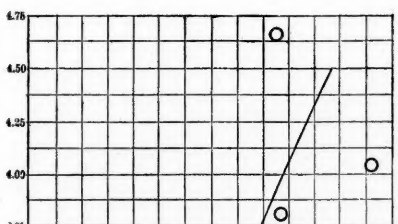
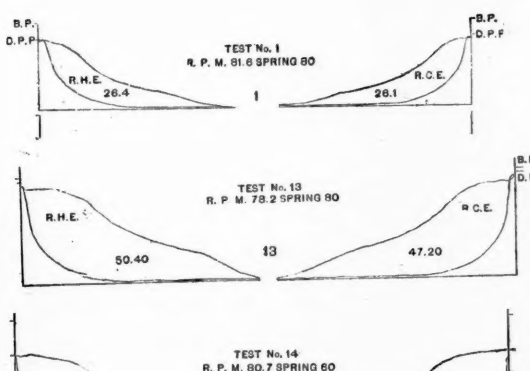


Fig. 3—Smoke Box Temperature.



Indicator Cards at Different Cut-offs.

LOCOMOTIVE TESTS AT PURDUE UNIVERSITY.

In all tests a difference of valve action produces an unequal division of work between the cylinders. The difference amounts to from 2 to 10 per cent. of the whole indicated power of the engine, a fact which will prove suggestive to those who would test locomotives by applying the indicator to one side only. The exhaust of the engine is not especially irregular.

The friction of the engine, which, in the present case, includes the friction of the mechanism only, appears irregular, and for several tests it is very large. This must be accounted for either on the score of variation in the condition of lubrication, or of faults in the work. As concerning the former, it may be said that the crank-pins and the rear axle-box on the left side ran warm for some of the tests, and, on two occasions, the right piston-rod was hot for a few minutes. These conditions, all varying with the different tests, may account for the variation of friction recorded, though it is possible that the explanation is to be sought elsewhere.

The dynamometer is known to be correct, and, with the dash-pot removed, it responds readily to slight changes of stress along the line of the drawbar. It is composed of simple levers, which construction would seem to insure uniform action for all tests. The locomotive drivers are directly over the centres of the supporting wheels when a line on the locomotive frame midway between the driver axles is plumb with a line on a brass plug set in the stone foundation. A tell-tale, which multiplies 10 times the actual forward and backward motion of the engine, was verified several times during the progress of the tests by plumbing the engine from the foundation. Ordinary precautions having thus been taken to secure an accurate record of the drawbar stresses, it has seemed proper, with this explanation, to include all of the results with the data of the tests, and to leave their verification to the work of another year.

Railroad Projects Now Open.

The list which follows purports to give only *bona fide* enterprises, and not mere paper schemes. Yet it is always difficult to prepare such a list and not exclude some that are sound and include some that are unsound. Now it is especially difficult. It is safe to say that a very small percentage indeed of the railroad projects named here will get beyond the stage which they had reached June 30, for many months yet. The actual stage of construction reached at that date may be seen by consulting this list, and information of those lines upon which construction had been completed and closed up on that date will be found in the list published in our issue of July 14.

NORTHERN STATES EAST OF THE MISSISSIPPI.

Maine.

Bangor & Aroostook.—Track laid in 1893 from Brownville for 5 miles; now being rapidly graded from Brownville northeast to Houlton, 94 miles; located from Houlton north to Van Buren, 83 miles. (See Feb. 10, page 118.) C. P. Treat, Chicago, contractor. F. W. Cram, of Bangor, General Manager, and Moses Burpee, of Houlton, Me., Chief Engineer.

Boothbay Harbor.—Surveyed from Boothbay Harbor north to connect with the Maine Central road, 13 miles. Officers say the road will be put under contract this year. Charles H. Fisher, Treasurer, Boothbay, Me.

Georges Valley.—Under contract and construction from Warren, north to Union, 8 miles. James Mitchell, West Warren, Me., contractor; I. C. Thurston, President, South Union, Me.

Kingfield & Dead River.—From Kingfield north 10 miles. Contract let in July to McGregor Bros., of Rumford Falls, Me. (See July 28, page 577.) A. F. Hilton, Kingfield, Me., Chief Engineer.

Portland & Rumford Falls.—Under contract and construction, extension from Mechanic Falls east to the Maine Central R. R., near Auburn. John Berry, Fayville, Mass., contractor. Frederick Danforth, Chief Engineer, Portland, Me.

New Hampshire.

Concord & Montreal, on Whitefield & Jefferson.—Under survey from Berlin to Pontsocook, 12 miles. F. A. Merrill, Chief Engineer, Concord, N. H.

Vermont.

Black River.—Contracts let in 1892 from Proctorsville east to Claremont Junction, 12 miles, all surveyed; grading not yet begun.

Massachusetts.

Southbridge, Sturbridge & Brookfield.—Brookfield to Southbridge, located in 1892, 13 miles; agreement recently made with New York syndicate for constructing the road.

New York.

Binghamton & State Line.—Surveyed in 1892 from Binghamton south to New York state line, 14 miles. Joseph H. Noyes, Chief Engineer, Binghamton, N. Y.

Brooklyn Elevated.—Fifth avenue and Thirty-eighth street to Third avenue and Sixty-seventh street, Brooklyn, to be completed in September; Fulton street and Schenck avenue to Crescent street and Jamaica avenue, completed. Cofrode & Saylor and Edge Moor Bridge Works have contract for elevated structure. O. F. Nichols, Brooklyn, N. Y., Chief Engineer and General Manager.

Long Island.—Track laid in 1893 on New York Bay extension from Hempstead Crossing, south to Valley Stream, 6 miles. Hawman Bros., Reading, Pa., contractors. Located from Fosters' Meadows to New Lots, 8 miles. Charter secured for Montauk Extension from Bridgehampton to Collenden Point, 25 miles. P. D. Ford, Chief Engineer, and W. A. Cattell, Principal Assistant Engineer, Long Island City.

Middlesex Valley.—Surveyed in 1893 from Stanley northeast to Geneva, 8 miles. W. W. Attwood, Manager; R. F. Uniacke, Chief Engineer, Naples, N. Y.

Oscawana & Cornell.—Five miles, Oscawana to new Croton aqueduct dam at Cornell, located and ready for construction; 21 miles to be located. Work suspended since May 16. Contractors, Marshall & Fover Co., 71 Cortlandt street, New York City. W. H. Gale, President, New York City. James S. Haring, Chief Engineer, Suffern, N. Y.

Unadilla Valley.—Graded for 8 miles from end of track at Leonardsville south toward New Berlin, 15 miles altogether. G. L. Rusling, 137 Broadway, New York, is contractor. (See June 2, p. 404.) F. A. Culver, 8[illegible] Broadway, New York, Secretary.

New Jersey.

Delaware River.—Survey being made from Penn's Grove southeast to Pennsville, 6 miles. E. H. Green, Engineer and Superintendent, Penn's Grove, N. J.

Lake Hopatcong, Boontown, Morristown, Caldwell & New York.—Caldwell, westerly to Rockaway, 18 miles; branch to Morristown, 7 miles; all surveyed, right of way partly secured. H. C. Raynolds, Whippany, N. J., Secretary.

South Jersey (Philadelphia, Sea Isle City & Cape May.)—Tuckahoe Junction, south to Cape May, 25 miles graded a few years ago is to be rebuilt and rails laid this year. E. A. Tennis, Thompsontown, Pa., contractor. Logan M. Bullitt, Philadelphia, President.

Pennsylvania.

Altoona & Philipsburg Connecting.—Track laid in 1893, from Osceola, north, 2 miles. Under contract from Philipsburg to Janesville, 20 miles; over 10 miles now graded and track being laid; road to be completed by Oct. 1. E. A. Tennis, Thompsontown, Pa., contractor. (See June 23, p. 473, July 14, p. 537.) Samuel P. Langdon, President, Bullitt Building, Philadelphia, Pa.

Bloomsburg & Sullivan.—Jamison to Gonaga Lake, 13 miles, surveyed. F. M. Leader, Bloomsburg, Pa., General Manager.

Buffalo & Susquehanna.—Branch of Sinnemahoning Valley, from Hull's east to Galeton, 17 miles, all graded; no work done in 1893. D. A. Crage, Buffalo, N. Y., and Broadhead & Bryon, Galeton, Pa., contractors. C. E. Botsford, Austin, Pa., Chief Engineer.

Central of Pennsylvania.—From Bellefontaine northeast to Mill Hall, connecting with the Beech Creek road, 27 miles; 500 men are now grading. No contracts let. (See May 26, p. 403.) J. P. Gephart is Superintendent of Construction and H. E. Richter, Chief Engineer, both of Bellefontaine, Pa.

Cresson & Clearfield.—The Susquehanna Division completed this year to Cherry Tree and the Chest Creek Division to connect with the Cush Creek Division crossing the Susquehanna River at McGees. Construction work now suspended. The road is a branch of the Pennsylvania. (See July 7, page 513.) J. U. Crawford, Engineer of Branch Lines, Philadelphia.

Cross Fork.—Branch of Sinnemahoning Valley road, along Cross Fork Creek, through Potter County, for 13 miles, graded. C. W. Goodyear, Superintendent, and C. E. Botsford, Austin, Pa., Chief Engineer.

Ebensburg & Black Lick.—Graded from Ebensburg west for 10 miles in July and August. Charles McFadden, Philadelphia, contractor. Surveyed through Indiana County to Black Lick Creek, and engineers are still in the field. The road is a branch of the Pennsylvania. (See July 7, page 537.)

Fall Brook.—Under construction from Mills to Ulysses, 7 miles, graded. Tracklaying will begin shortly. A. J. Himen & Co., Corning, N. Y., contractors. S. T. Hayt, Jr., Chief Engineer, Corning, N. Y.

Keystone.—Track laid in 1893, 4 miles, near Gardeau. Under construction, 8 miles near Gardeau, and 10 miles projected. Antonio Bovacqua and Antonio Bush, contractors. H. Clarence Rich, President, Emporium, Pa. L. G. Willson, Secretary, Gardeau, Pa.

Kishacoquillas Valley.—Track laid in 1893, near Alexander's to Reedsville, 4½ miles. About completed from Belleville to Alexander's Run, 4 miles. E. A. Tennis, Thompsontown, Pa., contractor. Samuel Watts, President, Belleville. F. F. Whittekin, Chief Engineer, Tionesta, Pa.

Lancaster, Oxford & Southern.—Surveyed from Providence Mills, Md., to Oxford, Pa., 9 miles. A. M. Nevin, Chief Engineer, Oxford, Pa.

Newport & Sherman's Valley.—Under survey from New Germantown, Perry County, southwest to McConnellsburg, Fulton County, 35 miles. D. Gring, President, Newport. A. P. W. Jonston, Chief Engineer, Harrisburg, Pa.

North Bend & Kettle Creek.—Six miles will be graded this summer; tracklaying commenced June 25. (See Aug. 4, page 596.) T. A. Blackwell, President, Driftwood, Pa.

Oregon & Texas.—Cammel to English Centre, 8 miles, under construction.

Pennsylvania.—Cresheim branch from Allen's Lane Station to Trenton Cut Off, 5 miles, completed in 1893; branch from Chelton Avenue Station, Philadelphia, to White Marsh, and the Philadelphia & Bustleton branch partly completed. Philadelphia & Delaware County, from Fernwood to Newtown Square, 10 miles, under contract to C. A. Sims & Co., Philadelphia.

Philadelphia Belt.—Bridge street, Philadelphia, along Delaware River to Princeton street, 2 miles, under contract. C. S. Campbell, 227 South Fourth street, Philadelphia, contractor; J. A. Wilson, C. E. and D. Jones Lucas, Drexel Building Philadelphia, Pa., Prin. Asst. Engr.

Philadelphia, Honesdale & Northern.—Preliminary survey made from White Haven northeast through Honesdale to Hancock, N. Y., near State line. H. Z. Russell, of Honesdale, Pa., President.

Philadelphia & Reading.—Branches from Logan Station to Olney, 2 miles; opened for traffic since June 30. Philadelphia & Northern, from Wister to Glenside, 6 miles, and Crescentville to Frankford, 3 miles, nearly completed, but work recently suspended.

Pittsburgh & Lake Erie.—Under construction, Elwell Run branch of the Pittsburgh, McKeesport & Youghiogheny, from Whitsett to New Myers coke ovens, 5 miles; Drake & Stratton Co., Ltd., Pittsburgh, Pa., contractors. (See July 14, p. 537, Aug. 18, p. 630.) J. A. Atwood, Chief Engineer, Beaver Falls, Pa.

Pittsburgh, Shenango & Lake Erie.—Track laid in 1893 from Meadville to Valonia for one mile; work is done by the company's forces. Frederick P. James, Chief Engineer, Greenville, Pa.; P. E. McCray, Meadville, Pa., Secretary.

Pittsburgh, Virginia & Charleston.—Right of way being secured south of Brownsville, Pa., to mouth of Ten Mile Creek, and surveys being extended along the Monongahela Valley.

Quaker City Elevated Company has charters for elevated railroads along Market street, Front street, and other streets in Philadelphia. Active construction work has been suspended since early spring on account of litigation with property owners. (See May 12, page 366.) C. W. Buchholz, Philadelphia, President.

State Line.—Branch of the Baltimore & Ohio, building from Smithfield south to W. Va., state line near Point Marion, 12 miles; grading completed, and track being laid. (See May 5, p. 347.) The contractors for the graduation and masonry: Bennett & Talbott, Greensburgh, Pa.; Langhorne & Allen, 101 W. Grace street, Richmond, Va.; Drake & Stratton Co., Pittsburgh, Pa.; P. H. Bennett, Fairmont, W. Va., and Lane Bros., Esmont, Va. The construction work is directed by W. T. Manning, Acting Chief Engineer, B. & O. R. R.

Tionesta Valley.—Hilltop to Sandy Creek, 3 miles, and Parish to Hunter's Run, 5 miles; company doing grading. F. F. Whittekin, Tionesta, Chief Engineer.

Tionesta Valley & Hickory.—Track laid in 1893 for 1½ miles, and grading completed Tionesta to Ross Valley, 5 miles. T. D. Collins, Nebraska Pa., President.

Western Maryland.—Track laid in 1893 near Spring Grove, northeast to York, 11 miles. Wright & Langhorne, contractors, 510 East Marshall street, Richmond, Va.; J. M. Hood, President and General Manager, Baltimore, Md.

Wilkes-Barre & Eastern.—Track laid in 1893, on various sections, 35 miles altogether; road is being built from Stroudsburg, northwest to Wilkes-Barre, 65 miles; grading nearly all completed, track being laid. Wilkes-Barre & Hudson River Construction Co. is building the line, of which R. L. Harrison, 59 Wall street, New York City, is the Manager. W. P. Ryman is President and I. E. Hartwell, of Wilkes-Barre, is Chief Engineer, of the railroad.

Williamsport & North Branch.—Nordmont, northeast to Dohm Summit; E. T. Gaynor & Co., La Porte, Pa., contractors. B. S. Welch, Hugesville, Pa., General Manager.

Ohio.

Cleveland, Lorain & Wheeling.—A line is projected from Cleveland, southwest to Mallet Creek, 23 miles, to be built under charter of the Cleveland & Southwestern R. R., to give an independent line into Cleveland. Wm. B. Hanlon, Chief Engineer, New Philadelphia, O.

Cleveland, Wooster & Muskingum Valley.—(Operated by B. & O.)—Work begun on branch from Wooster, south to Millers burg, 20 miles; contractors, McNair & Bracey, Chicago. (See July 7, p. 513.)

Eastern Ohio.—Track laid in 1893 from Morgan Junction to Campbell's Station, one mile; projected from Campbell's Station, on the Baltimore & Ohio, northeast to Freeport, on the Cleveland, Lorain & Wheeling, 20 miles. J. W. Campbell, General Manager, Cambridge, O.

Grand River & Mahoning.—Surveys run in 1893 from Lake Erie, near Fairport, southeast across the state to Ohio River, near Wheeling. James Ritchie, Cleveland, President.

Lake Erie & Western.—Right of way being secured for branch from Minster to Piqua, 25 miles. (See July 28, p 577.) T. H. Perry, Indianapolis, Chief Engineer.

Ohio Southern.—Track laid in 1893 from Springfield to St. Paris, 23 miles, up to July 1; nearly all graded from Springfield, northwest to Lima, 69 miles, and track will be laid probably this month. McArthur Bros., of Chicago, contractors; R. L. Cobb Chief Engineer, Springfield, O.

Pittsburgh, Akron & Eastern, on Akron & Eastern.—Akron, O., east to Newcastle, Pa., 70 miles; located in 1892; some grading done in 1893 east of Akron. J. H. Sample, Akron, O., Chief Engineer.

Snow Fork & Hocking.—Branch of Baltimore & Ohio, surveyed through coal fields in Hocking County, from near Shawnee south to Chauncey and to Athens, about 20 miles. David Lee, President, and W. A. Smith, Assistant Chief Engineer both of Zanesville, O.

Toledo & Ohio Central.—Under contract and construction from Ridgway, south to Columbus, 50 miles; Gen. J. S. Casement, Painesville, O., contractor. Grading about completed and track being laid. (See March 31, p 254.) J. C. Williams, Engineer in charge of construction, Columbus, O; Clifford Buxton, Chief Engineer, Toledo, O.

Indiana.

Bedford Belt.—One mile of belt line at Bedford remains to be completed. James K. Zollinger, Chief Engineer, 33 Kenyon Building, Louisville, Ky.

Brookville, Richmond & Union City.—Harrison, near Cincinnati, north to Union City, 68 miles; surveyed in 1891 by engineers of the Clev., Cincin., Chicago & St. Louis and right of way partly secured.

Chicago, Indianapolis & Chattanooga Southern.—Indianapolis, southwest to Mitchell, 75 miles, and Mitchell southwest to Rockport, 65 miles; surveyed in 1892; right of way partly secured. J. H. McCormick, Columbus, O., Chief Engineer.

Chicago & South Bend.—About 8 miles of additional track to be built from South Bend. C. W. Stover, General Manager, South Bend, Ind.

Chicago & Southeastern.—A section from Sand Creek, south to Brazil, 21 miles, is being graded by days labor; line projected from Anderson, northeast to Muncie, 18 miles. H. Moore, Superintendent, Anderson, Ind.

Fort Wayne, Terre Haute & Southwestern.—Partly graded in 1892 from Mansfield to Bainbridge, 18 miles; work delayed by litigation; contract let to E. P. Reynolds & Co., of Cincinnati. F. P. Welch, Rialto Building, Chicago, General Manager.

Indiana, Illinois & Iowa.—Knox north to South Bend, 33 miles, located in 1892. W. K. Woodruff, Kankakee, Ill., Chief Engineer.

Indianapolis, Logansport & Chicago.—Logansport south to Indianapolis, 70 miles; right of way secured, except at Indianapolis; some work done at Logansport. Walter A. Osmer, Logansport, Ind., Chief Engineer.

Ohio & Mississippi.—Under contract from Mitchell Hollow east to Bedford, 4 miles; Morris, Serpell & Co., Norton Building, Louisville, Ky., contractors. L. C. Fritch, Chief Engineer, Cincinnati, O.

Illinois.

Calumet & Blue Island.—Two miles of track laid in 1893 at South Chicago, 40 miles of road projected, probably mostly side tracks to factories. J. S. Keefe, Secretary, Chicago.

Chicago & Eastern Illinois.—Grading, masonry, etc., well under way from Rossville southwest to Sidell, 34 miles. McArthur Bros., Chicago, contractors. H. F. Baldwin, Chief Engineer, First National Bank Building, Chicago.

Chicago & New Orleans.—Surveyed from Altamont south and southeast to Carbondale, 106 miles; some grading done in 1891, nothing since. Oliver Ferguson & Sons, Evansville, Ind., contractors. A. G. Murray, Springfield, Ill., President.

Clayton & Pea Ridge.—From Clayton to Stanley, 2 miles; grading began June 8, and the road will probably be completed this summer. D. M. Halsted Construction Co., Clayton, Ill., contractors. C. A. Wever, Secretary, Clayton, Ill.

Jacksonville Southeastern.—Havana to Canton, 20 miles, practically all graded in 1892, bridge now being erected. Canton north to Rock Island, 100 miles, surveyed. W. S. Hook, Jacksonville, Ill., President.

Peoria & Eastern.—Under contract from Hilliary to Oakwood, 4 miles. Gooch, Rinehart & Co., Richmond, Va., contractors. J. A. Barnard, General Manager, Indianapolis.

St. Louis, Chicago & St. Paul.—Track laid in 1893 between Bates and Springfield, 12 miles, and 5 miles on Alton extension which is being built from Alton to connect with the St. Louis Merchants' Bridge Terminal Railroad at Kindar, 20 miles. I. W. Fowler, General Superintendent, and F. P. Reed, Chief Engineer, Springfield.

Terre Haute, Sailor Springs & Chester.—From Mount Vernon north to the Wabash River in Clark County. Surveys completed in July. S. W. Barnes, Sailor Springs, Ill.

Michigan.

Lowell & Hastings.—Projected, from Freeport, south to Hastings, 8 miles. W. H. Clarke, Traffic Manager, Lowell, Mich.

Manistique & Northwestern.—Manistique, on the north shore of Lake Michigan, northwest to Negaunee and iron mines, in the Upper Peninsula, 91 miles; surveyed and located; no contracts yet awarded. (See April 14, p. 291.) S. H. Beardslee, Chief Engineer, Manistique, Mich.

Wisconsin.

Ahnapee & Western.—Ahnapee northeast to Sturgeon Bay, 20 miles, grading about three-fourths completed, work done by the company. E. Decker, Ahnapee, President.

Bayfield Harbor & Great Western.—Bayfield to Iron Range Station, 18 miles; located in 1892. F. W. Dalyrmple, Bayfield, President.

Duluth-Superior Belt.—Eighteen miles of single track surveyed in the city of Superior; the company is now securing right of way, and expects to let contracts in a few weeks. Day K. Smith, President, Duluth, Minn.

Eau Claire, Mississippi River & Lake Superior.—Surveyed from Winona, Minn., northeast to Independence, Wis., 30 miles, and to Chippewa Falls, 45 miles; nothing further done. Charles E. Bussell, Chief Engineer, 516 Bridge street, Eau Claire, Wis.

Iola & Northern.—Branch of the Green Bay, Winona & St. Paul, from Scandinavia north to Iola, 8 miles, completed; survey made for about 20 miles farther. McIntosh Bros., of Milwaukee, contractors. W. J. Abrams, Green Bay, President.

Marinette & Western.—Surveyed from Marinette west to Abbottsford, 140 miles. G. W. Hanley, Secretary, Marinette, Wis.

Northwestern Coal & Railroad Company.—About 12 miles of track to be built at Superior, Wis., to connect with the company's docks and the railroads reaching Superior. McMullen & Morris, St. Paul, contractors. C. J. A. Morris, of St. Paul, is Chief Engineer.

Rice Lake, Dallas & Menominee.—Under contract, from Rice Lake south to Dallas, 22 miles. George E. Anthony, Rice Lake, Wis., contractor. Preliminary survey made from Dallas to Menominee. S. C. Olmstead, President, St. Paul, Minn. H. A. Clark, Chief Engineer, St. Paul.

St. Paul, Minneapolis & Lake Superior.—Chartered in 1893 to build from St. Paul, Minn., northwest to Superior, Wis., 137 miles. Donald Grant & Co., Faribault, Minn., contractors; 45 miles in Minnesota, 92 miles in Wisconsin. (See June 2, p. 417.) F. H. Anson, General Manager, Oneida Block, Minneapolis, Minn.

SOUTHERN STATES EAST OF THE MISSISSIPPI.

Maryland.

Baltimore Belt.—Hamburg street, Baltimore, to Bay View Junction, 7 miles; tunnel work completed. Controlled by Baltimore & Ohio. Ryan & McDonald and L. B. McCabe & Bro. of Baltimore, contractors. (See May 12, p. 365.) W. T. Manning, Chief Engineer, Baltimore.

Baltimore & Cumberland.—Locating survey being made from Cumberland east to Hagerstown, 60 miles. This road is an extension of the West Virginia Central & Pittsburg; contracts will be let this year. (See April 2, p. 309; May 26, p. 403; June 16, p. 443.) Chauncey Ives, Chief Engineer, Hancock, Md.

Baltimore & Drum Point.—Partly graded from a point south of Baltimore to Drum Point, 80 miles; contract to complete the road let to Van Aken & Hays, of New York. J. H. McCreery, Washington, D. C., General Manager of the construction company. Edward Lauterbach, New York, President of the railroad, and F. R. Beidler, Baltimore, Vice-President.

Washington & Chesapeake Beach.—From Washington southeast to Chesapeake Bay, 27 miles; contract let in December last to Godeffroy & How, 45 Broadway, New York City, active work not yet begun. L. H. Hyer, Chief Engineer, Washington, D. C.

Virginia.

Abingdon Coal & Iron.—Abingdon to Damascus, 15 miles partly graded; Damascus to Mountain City, 16 miles; surveyed. Road purchased in April by F. Fortune and others. J. C. Watson, Jr., Abingdon, Va., Chief Engineer.

Portsmouth Park.—Belt road at Portsmouth connecting with Norfolk & Western, 4 miles; to be built by the Portsmouth Park Railroad & Development Co.

Richmond & Chesapeake.—Richmond northeast to Potomac River, 67 miles, including a tunnel under one of the streets at Richmond, Va. The contract for latter work is let to Mason, Hoge & Co., of Frankfort, Ky. No work has been done for several years. N. E. Reed, of New York City, is President.

Roanoke, Fincastle & Clinton Forge.—Fincastle south to Cloverdale, 11 miles, nearly all graded in 1891; extension proposed to Roanoke. James K. Brown, Roanoke, Va., Chief Engineer.

West Virginia.

Baltimore & Ohio.—Extension of Fairmount, Morgantown & Pittsburgh from Morgantown north to state line near Point Marion, Pa., 10 miles. Grading completed, track will be laid in a few weeks. (See June 30, p. 495, and August 11, p. 630, and May 5, p. 347, under State Line.) W. T. Manning, Baltimore, Md., Chief Engineer.

Chesapeake & Ohio.—Tracklaying completed in July on Gauley branch to connect with the Kanawha & Michigan and grading about completed on Loup Creek branch from Rush Run, and on Keeney's Creek branch, 6 miles. (See June 26, p. 473, and July 14, p. 537.) H. Frazier, Richmond, Va., Chief Engineer.

Dry Fork.—Grading to be commenced shortly on first 30 miles south of Bretz. (See July 14, p. 537.) Robert Whitmore, Philadelphia, President.

Pennsylvania Lines.—New Cumberland to point opposite Liverpool, O., on New Cumberland branch, 9 miles graded. M. J. Becker, Pittsburgh, Pa., Chief Engineer.

Powellton & Pocahontas.—Eight miles under survey. D. T. Evans, Supt., Powellton, W. Va.

Roaring Creek.—Preliminary survey made in 1893 by John W. Moore, Chief Engineer, from Elkins on the W. V. C. & P. R. R., up the Roaring Creek Valley to its headquarters.

Wheeling Bridge & Terminal.—New line 3 miles long, along Ohio River from Wheeling to factories at Benwood, nearly completed. (See April 7, p. 272, June 30, p. 496.) C. O. Brewster, President, 261 Broadway, New York City.

North Carolina.

Caldwell & Northern.—Under construction from Lenoir to Wilson's Creek, 15 miles. Tracklaying began in July. Dunnavant, Corpenning & Miller, contractors. J. F. Montgomery, Chief Engineer, Lenoir, N. C.

Glendon & Gulf Mining & Manufacturing Co.—Track laid in 1893 from Gulf southwest to Glendon, for 10 miles. Proposed to build from Glendon to Charlotte, 90 miles. Frank D. Jones, Chief Engineer, Gulf, N. C. John B. Lenning, President, Bridesburg, Philadelphia, Pa.

Raleigh & Western.—Under construction for 10 miles west of Egypt, N. C. (See July 7, p. 513, and July 14, p. 537.) Preliminary survey made to Ashboro, N. C., 40 miles. Samuel A. Henszey, of Philadelphia, and Egypt, N. C., President.

Wilmington, Newbern & Norfolk.—Extension just completed under charter of East Carolina Land & Railway Co. from Jacksonville northeast to Newbern, 33 miles. Ten miles of track laid since July 1. H. A. Whiting, Jacksonville, N. C., General Manager, and F. B. Morse, Chief Engineer.

South Carolina.

Atlantic Coast Line.—Under construction from Remini southwest to Denmark, on the South Bound road, 44 miles. Contract let in June to E. S. Moorman, of Lynchburg, Va., to be completed in Jan., 1893. (See June 30, p. 557.) F. Gardner, Chief Engineer, Wilmington, N. C.

Branchville & Bowman.—Projected from Bowman northeast to Vance, on the Charleston, Sumter & Northern, 15 miles. E. T. R. Smook, Superintendent, Branchville, S. C.

Pickens.—Easley to Pickens, 9 miles; graded, but no work done since 1892. Work is expected to again begin shortly. Julius E. Boggs, President, Pickens, S. C.

Georgia.

Boston & Albany (Ga.).—Track laid in 1893 from Dot north to Moultrie, 8.5 miles, and from Shelby Junction west, 1.5 miles. Under construction from end of track near Shelby Junction, 3 miles, work being done by the company. C. W. Pidcock, Superintendent, Pidcock, Ga.

Florida Central & Peninsular.—Track laid in 1893 on the Savannah extension, about 16 miles, 10 miles being in Florida. The extension is a very direct line between Hart's Roads, north of Jacksonville, Fla., and Savannah, Ga., about 114 miles. Nearly all graded, a large force now building bridges and laying track. Southern Supply Co., Atlanta (I. Y. Sage, President) contractors for the entire work. (See April 7, p. 271.) W. S. Green, Jacksonville, Fla., Chief Engineer.

Middle Georgia & Atlantic.—Track laid in 1893 from Machen to Bear Creek, 16 miles. Under construction from West Bear Creek northwest to Covington, 8 miles. Work being done by the company; grading done in 1890. (See March 24, p. 235.) Arthur Pew, Chief Engineer, Machen, Ga.

Oconee & Western.—Track laid in 1893 from Rocky Creek to Dublin, for 8 miles. Under construction from Hawkinsville to Grovania, 13 miles; grading completed, ready for the ties and rails. Willis & Holdshouser, Dublin, Ga., contractors. (See Jan. 13, p. 40.) A. E. Hachfield, President, 7 Pine street, New York City. J. W. Hightower, General Manager, Empire, Ga.

Florida.

Atlantic, Suwannee River & Gulf.—Track laid in 1893 from Starke west to Sampson, 6.5 miles. Under contract from Sampson southwest to La Crosse, 13 miles; this section is being built by the Ambler Lumber Co., of Jacksonville; projected from La Crosse west to the Suwannee River, 50 miles. Arthur Meigs, General Manager, Jacksonville, Fla.

Carrabelle, Tallahassee & Georgia.—Now being graded from present terminus at Sopchoppy, Fla., near Thomasville, Ga., south to Tallahassee, 30 miles. J. H. Davidson & Co., Tallahassee, Fla., contractors. Line surveyed. C. P. Simmons, 29 Broadway, New York; A. Orr Symington, General Manager, Carrabelle, Fla.

Geneva, Florala & Pensacola.—Projected from Geneva, Ala., to Laurel Hill, Fla., 40 miles. W. C. McLauchlin, President, Geneva, Fla.

Jacksonville, St. Augustine & Indian River.—Track laid in 1893 from Coquina south to Melbourne for 22 miles. Under construction from Melbourne south along Indian River to West Palm Beach, Lake Worth, 15 miles, and much of the grading done. J. D. Lennan, Cocoa, Fla., contractor. Charles O. Haines, Chief Engineer, Cocoa, Fla.

South Florida.—Track laid in 1893 from High Springs south 10 miles, and from Juliette north 10 miles, all on Dunellon extension. Grading completed for 12 miles north of Juliette and 16 miles south of High Springs. Morgan, Reynolds & Walker, contractors. (See April 21, p. 310.) T. L. Morton, Consulting Engineer, Sanford, Fla.

Western of Florida.—No work has been done this year, but the company expects soon to extend the line to Micanopy, 20 miles. Goold T. Butler, Chief Engineer, Green Cove Springs, Fla.

Alabama.

Abbeville Southern.—Under contract and construction from Abbeville Junction on the Alabama Midland, north to Abbeville, 27 miles; grading began in June, and work to be completed by Dec. 31. S. G. Pruett, Montgomery, Ala., contractor. (See June 30, p. 495.) S. G. McLendon, President, Thomasville, Ga. B. Dunham, Chief Engineer, Montgomery, Ala.

Mobile & Birmingham.—Plateau Station into city of Mobile 2½ miles, under construction.

Escambia.—Surveyed from Steadham north to Little River, 5 miles. J. J. Sullivan, Secretary, Flomaton, Ala.

Mobile & Ohio.—A line from near Columbus southeast to Montgomery, Ala., about 160 miles, was authorized at a stockholders' meeting this year. It is supposed the Directors intend to purchase and complete the partly graded Montgomery, Tuskaloosa & Memphis road. James C. Clark, of Mobile, Ala., President and General Manager.

Montgomery, Hayneville & Camden.—Partly graded from Camden east for 11 miles; line surveyed from Camden northeast to Montgomery. S. D. Bloch, Camden, Ala., President.

Montgomery, Tuscaloosa & Memphis.—Montgomery, northwest of Tuscaloosa, 105 miles; partly graded in 1891. J. M. Woolfolk, Montgomery, Ala., Secretary.

Rutledge & Julian.—Being built from Julian to Rutledge, 4 miles, by J. W. Ivey, of Julian.

Mobile & West Alabama.—Survey made in 1892 by Col. John A. Milnor, of Birmingham, from Tuscaloosa south through western part of Alabama to Mobile, 350 miles.

Tennessee.

Gulf & Tennessee.—Survey to be made this season from Jackson south to Middleton, 42 miles. (See May 26, p. 403.) G. F. B. Howard, President, Jackson, Tenn.

Harriman Coal and Iron.—Track laid in 1893, 2 miles from De Armond Station. Surveyed from Harriman north to the coal fields, 12 miles. J. A. Fairleigh, Chief Engineer, Harriman, Tenn.

Nashville & Knoxville.—Algood east to Standing Stone, 13 miles under construction; projected from Standing Stone to junction with Cincinnati Southern Railroad, 40 miles. R. J. Moscrip, Cooksville, Tenn., Chief Engineer.

Kentucky.

Altamont & Manchester.—Located from near Altamont east 7 miles toward Manchester, work to begin this month. A. M. Crooke, Secretary, Altamont.

Beattyville & Cumberland Gap (formerly Winchester & Beattyville).—One mile to coal mine, built in 1893. Various short mine branches to be built, and it is expected to build up middle fork of Kentucky river toward Pineville and Cumberland Gap. J. H. Pearson, Chief Engineer, Louisville, Ky.

Hodgenville & Elizabethtown.—Preliminary survey completed in May from Hodgenville south to Scottsville, Ky., about 70 miles. Completed road 11 miles long is operated by Chesapeake, Ohio & Southwestern.

Jellico, Birdeye & Northern.—Track laid in 1893 from Jellico (State line) to Halsey, 8 miles. Branch of 5 miles to coal mines in Whitley county proposed. Chattanooga Construction Co., contractors. B. R. Hutchecoft, General Manager, Halsey, Ky. W. C. Crozer, Chief Engineer, Jellico, Tenn.

Louisville & Nashville.—Log Mountain branch, 20 miles up Clear Creek in Bell county to be completed in August. (See March 3, p. 79). C. O. Bradford, Louisville, in charge of construction.

Louisville Terminal.—Six miles of belt line graded at Louisville, Ky., in January. H. V. Harris, Louisville, Superindendent.

West Virginia, Pineville & Tennessee.—Track laid in 1893 from Truxton to Taylors, one mile. Now being surveyed up left fork of Straight Creek to Sims Fork, 6 miles, to be completed by Jan. 1, 1894. J. D. Blake, President, Pineville, Ky.

SOUTHWESTERN STATES.

Louisiana.

Kansas City, Watkins & Gulf.—Projected from near Lake Charles, south to the Gulf of Mexico, at Calcasieu Pass, about 35 miles. P. H Philbrick, C. E., Lake Charles, La.

New Orleans & Northwestern.—Rayville north to Collins, 18 miles, surveyed.

Lafayette, Vermillion & Gulf.—Incorporated in 1893, to build from Abbeville northeast to Lafayette, 25 miles. T. H. Leslie, Stuttgart, Ark., promoter and contractor.

Sibley Lake Bastineau & Southern.—Track laid in 1893 from Yellow Pine to Bluff City, 3 miles. Under contract from Yellow Pine to Ringgold, 13 miles. William F. Heflin, Yellow Pine, La., contractor; E. C. Bright, Chief Engineer, Minden, La.

Southern Pacific.—Branch of Louisiana Western from Crowley north, 21 miles. Contract let in July to J. P. Hughes, of Fort Smith, Tex. (See July 28, p. 578.) E. B. Cushing, Houston, Tex., Engineer in Charge.

Arkansas.

Hot Springs & Mountain Valley.—Surveyed from Hot Springs north to Mountain Valley, 13 miles. Zeb. Ward, Jr., General Manager, Little Rock, Ark.

Louisiana, Arkansas & Missouri.—Surveyed from Trippe Junction, Ark., to Bryan City, La., 120 miles. (See Jan. 6, p. 17.) Harlow M. Hoyt, 16 Exchange place, New York City, is President, and W. Barclay Parsons, 22 William street, New York City, is Chief Engineer.

Springville, Yellville & White River.—Winnerva to Yellville, 24 miles, under contract; projected, Yellville west to Harrison, Ark., and to Springfield, Mo., 110 miles. D. W. Pike, Kansas City, Mo., Chief Engineer.

Stuttgart & Arkansas River.—From Darell, south to Gillett, 8 miles, under contract. F. M. Gillett, President, 3 Wall street, New York City.

Texarkana & Fort Smith.—Being slowly extended from Wilton north to Little River, 12 miles. W. C. Merritt, Texarkana, contractor. Projected and partly surveyed to Fort Smith, over 100 miles. Road is controlled by Kansas City Pittsburgh & Gulf. F. B. Hubbell, General Manager, and J. A. Dougherty, Chief Engineer, both of Texarkana.

Missouri.

Kansas City, Osceola & Southern.—Projected from Brownington south to North Greenfield, 70 miles. B. S. Josselyn General Manager, Kansas City, Mo.

Kansas City, Pittsburgh & Gulf.—Track laid in 1893 from M., K. & T. junction south of Hume, Mo., to Pittsburgh, Kan., 31 miles; being extended from Pittsburgh to Joplin, Mo., the northern terminus of the Kansas City, Ft. Smith & Southern, now leased by this road. B. Corrigan, of Kansas City, Mo., contractor. The plan of the company is to continue the line south of Sulphur Springs to Ft. Smith, 81 miles, and ultimately to the Gulf of Mexico. (See Aug. 4, p. 597.) A. M. Nelson, of Kansas City, Chief Engineer.

Missouri Southeastern.—Track laid in 1893 to Coxas, 2 miles. The road is 7 miles long, and is to be completed to Bloomfield in August. Work is also being done slowly on a 5 mile extension eastward from Bloomfield. George H. Crumb, President and General Manager, Bloomfield, Mo.

St. Louis, Keokuk & Northwestern.—Track laid in 1893 to Bellefontaine, Tex., at the Missouri River, 19 miles. Under construction from bridge site south to the city limits of St. Louis, 10 miles. The line is being built to give the Chicago, Burlington & Quincy a new entrance into St. Louis, and is about 46 miles long from Cuivre Junction, where it branches from the present line. R. M. Quigley & Co., of St. Louis, contractors. L. F. Goodale, Chief Engineer, St. Joseph, Mo.

St. Louis Merchants' Terminal.—Belt line from North St. Louis to Carondelet, 12 miles, being built to give new connections with the St. Louis Merchants' bridge. J. Ware Construction Co., St. Louis, contractors.

Texas.

Gulf, Beaumont & Kansas City.—Under contract, construction begun in June, from Beaumont north 20 miles. Preliminary survey made from Beaumont for 100 miles north. R. H. Downey & Bro., Beaumont, Tex., contractors. L F. Daniell, Chief Engineer, Beaumont, Tex. (See May 19, p. 375; June 9, p. 425.) John H. Kirby, General Manager, Houston, Tex.

La Porte, Houston & Northern.—La Porte north to Harrisburg, near Houston, 16 miles, graded in 1892, track not yet laid. Harrisburg to Clear Creek, 8 miles, surveyed. C. G. Woodbridge, La Porte, Tex., Chief Engineer.

Myrtle Springs.—From Myrtle Springs to Wills Point, 10 miles; grading to begin this summer. T. J. McKain, Wills Point, Tex., contractor. B. F. Barrett, Secretary, Myrtle Springs, Tex.

Rio Grande & Northern.—Preliminary survey being made from Van Horn south 35 miles, to coal mines near Rio Grande River. G. N. Marshall, El Paso, Tex., Chief Engineer.

South Galveston & Gulf Shore.—End of track, through South Galveston, 5 miles, under construction. George J. Gray, Galveston, Tex., President.

Texas Central.—Ross into Waco, 11 miles, and branch to Thurber coal fields, 30 miles, surveys made in 1893. C. Hamilton, Waco, Vice-President and General Manager.

Texas, Louisiana & Eastern.—Graded west of Cleveland station for about 10 miles toward the Trinity River.

Texas City Terminal.—From near Virginia Point west to Galveston Bay, 7 miles, being built by Meyer Bros., of Duluth.

Texas, Sabine Valley & Northwestern.—Track laid in 1893 from Carthage to end of track, 2 miles. Under survey from terminus to Centre, 27 miles. Richard J. Evans, General Manager, Longview, Tex.

Velasco Terminal.—Angleton to Arcata Junction, 20 miles, projected. Wm. D. Lee, Velasco, Tex., Vice-President and General Manager.

Indian Territory.

Choctaw Coal & Railway Co.—Projected from South McAlester west to Oklahoma City, Oklahoma, 121 miles; some preliminary surveying done in 1891. J. D. Bradford, Manager, South McAlester, Indian Territory.

Colorado.

Aspen & Maroon.—Under survey for 12 miles from Aspen; projected to Crested Butte, 30 miles. Charles E. Shriver, Engineer, Aspen, Col.

Crystal River.—Track laid in 1893 from Carbondale to Hot Springs, 12 miles. Grading completed from Hot Springs to Coal Basin, 16 miles; Orman & Crook, Pueblo, Col., contractors. Surveyed from Coal Creek to Crystal, 17 miles. (See April 28.) J. A. Kibler, General Manager, Denver, Col. Thomas H. Wigglesworth, Chief Engineer, Carbondale, Col.

Denver & Rio Grande.—Branch from Crested Butte to Ruby-Anthracite coal mines, about 11 miles, completed in August. George Bell and Levy & Moore, contractors.

Midland Terminal.—From Divide Station on Colorado Midland to Midland, 8 miles, grading completed. From Midland to Cripple Creek, partly graded. The line will be about 32 miles long, of which about two-thirds is graded. Construction work suspended at present. R. Newell, Jr., Colorado Springs, General Manager.

Pueblo, Gunnison & Pacific.—Surveyed in 1891 for 61 miles south of Pueblo. H. R. Holbrook, Chief Engineer, Pueblo, Col.

New Mexico.

Pecos Valley.—Under contract from Eddy north to Roswell, 90 miles; preliminary survey made in 1893. The Pecos Co., contractors; Jefferson N. Miller, General Superintendent, Eddy, N. M.

Arizona.

Santa Fe, Prescott & Phœnix.—Track laid in 1893 from Ash Fork to Prescott, 41 miles; under construction from Prescott south to Phœnix, 110 miles. B. Lantry & Sons, Prescott, Ariz., contractors for the grading. (See March 24, p. 235.) G. W. Vaughan, Chief Engineer, Prescott, Ariz.

Mexican Northern Pacific.—Fifty miles of grading finished south of Deming to Mexican boundary; rails shipped from England. Huss, Townsend & Co., Chicago, contractors.

Utah.

Great Salt Lake & Hot Springs.—Under survey from end of track at Bountiful north and east to Coalville, 60 miles. Simon Bamberger, General Manager; H. S. Joseph, Chief Engineer, Salt Lake City.

San Pete Valley.—Graded from Chester south to Manti, 16 miles. H. S. Kerr, Salt Lake City, Superintendent.

Nevada.

Nevada Southern—Track laid in 1893 from Blake, on Atlantic & Pacific Railroad, to mines at Purdy and Summit, 30 miles. Survey being made from Summit to the Nevada State line, about 27 miles, and projected to Good Springs, Nev., about 30 miles beyond. Bright & Crandell, of Los Angeles, contractors. (See March 24, p 235.) R. B. Burns, of Williams, Ariz., Chief Engineer; George C. Manly, of Denver, Secretary.

NORTHWESTERN STATES.

Nebraska.

Chicago, St. Paul, Minneapolis & Omaha.—From Ponca north to Newcastle, on the Missouri River, 11 miles; grading completed, and track laying just begun. Winston Bros., Minneapolis, Minn., contractors; Charles W. Johnson, Chief Engineer, St. Paul, Minn.

Northeastern Nebraska Improvement Co.—Surveyed from South Sioux City to Homer, 16 miles. C. D. Smiley, President, South Sioux City, Neb.

Sioux City, Chicago & Baltimore.—Preliminary surveys made from Sioux City through eastern Nebraska for over 100 miles. Subsidies for $490,000 have been voted, and about 40 miles east of Sioux City may be built this year under terms of this subsidy. T. P. Gere, of Sioux City, is Vice-President.

Yankton, Norfolk & Southwestern.—Under contract and partly graded from Pierce, at the Missouri River; southeast to Norfolk, 27 miles; Owens Bros., Norfolk, Neb., contractors. A. K. Nash, Chief Engineer, Yankton, S. D.

Minnesota.

Brainerd & Northern Minnesota.—Preliminary survey made this year from northern terminus near Pine Mountain Lake to Leech Lake. R. W. Jones, Minneapolis, General Manager.

Duluth & Iron Range.—Track laid in 1893 from McKinley west for 6½ miles. Branch being extended to mines in Mesabi iron range, 6 miles. Winston Bros., Minneapolis, contractors; under survey from Lake Superior to western Mesabi iron range about 60 miles. R. Angst, Chief Engineer, Duluth, Minn.

Duluth, Missabe & Northern.—Track laid in 1893 from Stonybrook Junction toward West Duluth, for 12 miles, before July 1. Balance of line, about 12 miles, completed in July. Wolfe & King, contractors. Surveys made for short branches in Mesabi iron range. (See Aug. 4, p. 597.) C. H. Martz, Chief Engineer, Duluth, Minn.

Duluth Transfer.—One mile of track laid in Duluth in 1893, and 4 miles between West Duluth and New Duluth, and one mile in the city under construction. Foley Bros. & Guthrie, of St. Paul, Minn., contractors; Day K. Smith, of Duluth, Minn., is President.

Port Arthur, Duluth & Western.—Gunflint iron mine, at International boundary line, to iron mines at Ely, 25 miles. R. A. Hazlewood, Port Arthur, Ont., Chief Engineer.

Great Northern.—Grading completed for 20 miles from Park Rapids, northeast toward Leech Lake. Foley Bros. & Guthrie, contractors. (See July 14, p. 537.) N. D. Miller, St. Paul, Chief Engineer.

South Dakota.

Burlington & Missouri River.—Branch from the Deadwood line west to Seapfish, S. D., to be completed in September.

Dakota, Wyoming & Missouri River.—Near Rapid City to Mystic, 33 miles, contract let to C. D. Crouch in 1892; work not begun; surveyed, Mystic to Missouri River, 70 miles. W. T. Coad, Rapid City, President.

Duluth, Pierre & Black Hills.—Faulkton southwest to Blunt, near Pierre, 60 miles, located; road graded Aberdeen southwest to Faulkton. No work done in 1893.

Sioux Falls, Yankton & Southwestern.—Grading completed from Sioux Falls, southwest to Missouri River and Yankton, 60 miles; tracklaying just begun; road to be completed in September. Hon. R. F. Pettigrew, of Sioux Falls, President.

North Dakota.

Minneapolis, St. Paul & Sault Ste. Marie.—Track laid in 1893 from Cathay northwest to a point beyond the Sheyenne River, over 80 miles, up to Aug. 1. Track being laid to International Boundary Line, connecting there with Canadian Pacific extension, the distance from Cathay being 180 miles. Linton & Co., of Minneapolis, contractors. (See July 21, p. 556.) W. W. Rich, of Minneapolis, Chief Engineer.

Red River Valley & Western.—From Addison west, 12 miles, under contract to Foley Bros. & Guthrie, of St. Paul; chartered in July to build to James River, 70 miles. Frank Lynch, Casselton, President

Wyoming.

Burlington & Missouri River.—Track laid in 1893 on about 8 miles beyond Sheridan, and graded from end of track to Montana state line about 25 miles. Kilpatrick Bros. & Collins, contractors. Construction is now being suspended. I. S. P. Weeks, Lincoln, Neb., Chief Engineer.

Montana.

Butte, Anaconda & Pacific.—Tracklaying to begin shortly on main line from Butte to Anaconda, 25½ miles; already graded. W. L. Hoge, President, and F. C. Cruger, Secretary.

Idaho.

Boise Railway & Terminal Co.—Constructing a new terminal for the Union Pacific system into Boise City, 3 miles. Ryan & Griffin, Salt Lake City, Utah, contractors. E. E. Calvin, Superintendent, Pocatello, Idaho.

PACIFIC STATES.

California.

California Midland.—Projected from Sacramento and Antioch south through San Joaquin Valley to Bakersfield, 350 miles Charles E. Ertz, San Francisco, Cal.

Monterey & Fresno.—From Monterey, on Pacific Coast, across the mountains to Fresno, about 160 miles. Some surveying done in spring of 1893. A. W. Jones, of Kansas City, President; H. A. Greene, Monterey, General Manager.

San Diego & Yuma.—Grading reported commenced at San Diego in June. Surveys have been mane to Yuma, Ariz., 175 miles. D. C. Reed, of San Diego, President.

Southern Pacific.—Track laid in 1893, 14 miles on various branches. Line from Berbank west to Chattsworth Park, 21 miles, now building, and 11 miles of track laid. Turton & Knox, of Sacramento, contractors. (See July 28, p. 578.) Santa Margarita south to San Luis Obispo, 16 miles. George Stone & Co., San Francisco, contractors. This is the first section of the proposed new coast line to Ellwood, 110 miles; all surveyed some time ago. William Hood, San Francisco, Chief Engineer.

Oregon.

Coos Bay, Roseburg & Eastern.—Track laid in 1893 from Cedar Point south to Coquille City, 3 miles. Under construction from Coquille City south to Myrtle Point, 9 miles. R. A. Graham, contractor. Projected and partly surveyed from Myrtle Point east to Roseburg, 65 miles. W. Z. Earle, Chief Engineer, Marsfield, Or.

Rogue River Valley.—Projected from Medford north to Klamath Falls, 95 miles, and preliminary survey made. J. S. Howard, Chief Engineer, Medford, Or.

Washington.

Bellingham Bay & Eastern.—Four miles from Whatcom to Lake Whatcom, located to avoid heavy grades and trackage. J. J. Donovan, New Whatcom, Wash., Chief Engineer.

Everett & Monte Cristo.—Track laid in 1893 from end of track at Stillaguamish River east to Silverton, 20 miles, and road now open to that point. Track will be completed to Monte Cristo mines, 12½ miles, in a few days. Henry & Balch, Seattle, contractors. S. B. Fisher, Everett, Wash., Chief Engineer.

CANADA.

Nova Scotia.

Boston & Nova Scotia Coal Co.—From Broad Cove coal mines to Orangedale, Cape Breton, 35 miles. Contract let in July to Garson, Purcer & Co., of St. Catharines, Ont. (See July 21, p. 557.) C. M. Odell, of Mabou, Cape Breton, Chief Engineer. Boston office, 66 State street.

Terminal City.—Surveyed from Mulgrave to Terminal City, 7 miles. C. W. Locklin, Secretary, 31 Milk street, Boston, Mass.

New Brunswick.

Temiscouata.—Projected from Edmunton to St. Leonards, 24 miles. R. Adams Davy, Chief Engineer, Rivière du Loup, Quebec.

Woodstock & Centreville.—From Woodstock north to Centreville near the Maine State line, 15 miles. Contract let to Lawlor, Connor & Co., of St. Johns, N. B.

Quebec.

Baie des Chaleurs.—Track laid in 1893 from New Richmond, the former eastern terminus, east to Caplin, 10 miles. Under construction from peesent terminus at Caplin east to Paspebiac, 20 miles. C N. Armstrong, Manager, 17 St. James street, Montreal, Canada.

Drummond County.—Projected from St. Leonard northeast to Chaudiere, on St. Lawrence River near Quebec, 65 miles; work to be done by the company. Samuel Newton, Secretary, Drummondville, Que.

Grand Trunk.—Branch of one mile to Cote St. Paul, Montreal, surveyed, E. P. Hannaford, Chief Engineer, Montreal.

Montreal & Ottawa (operated by Canadian Pacific).—To be extended grădually from Point Fortune to Ottawa, about 60 miles.

Montreal & Western.—Under contract from present terminus at St. Jovite north to La Chute aux Iroquois, 18 miles. John Kennedy, A. McDonald, W. H. Doran and Joseph Pelletin, St. Jovite, Que., contractors. G. H. Garden, Chief Engineer, St. Jovite, Que.

United Counties.—From Ste. Angele to Iberville, 8 miles, and from St. Hyacinthe to St. Judes, 12 miles; work being done by the company's forces. Projected from Ste. Judes to Sorel. C. D. Nage, President, St. Hyacinthe, Que.

Ontario.

Atlantic & Northwestern.—Branch of Canadian Pacific, from Eganville west toward Parry Sound; contracts were let in April, and it was then proposed to build 50 miles this year. (See May 5, p. 346.) C. W. Spencer, General Superintendent, Montreal.

Kingston, Napanee & Western.—Under construction from Harrowsmith east to Sydenham, 4 miles, work being done by company; under survey a line from Tweed northwest to iron ore beds, 30 miles, for which the company has received a government subsidy. R C. Carter, General Manager, Deseronto, Ont.; M. J. Butler, Chief Engineer, Deseronto, Ont.

Ottawa, Arnprior & Parry Sound.—Ottawa west to Arnprior, 35 miles; grading completed; projected west toward Parry Sound, 170 miles; the line is an extension of the Canada Atlantic. George A. Montain, Ottawa, Ont., Chief Engineer.

Parry Sound Colonization. Bear Lake west to Eaginstown, 10 miles, graded; Eaginstown west 20 miles, under contract, being graded. S. R. Paulin, Emsdale, Ont, Chief Engineer.

Ottawa & Gatineau Valley.—Under construction from Kazabazua, to Pickanock, 10 miles. Projected from Pickanock to Maniwaki, 30 miles; company doing its own work. W. D Harris, Chief Engineer, Central Chambers, Ottawa; H. L Maltby, Secretary, Montreal.

Assiniboia.

Canadian Pacific.—Track laid in 1893 up to July 1 from Estevan southeast, 11 miles; grading is completed through Assiniboia from Pasqua to Stirling, near the boundary line of North Dakota, where connection was made with the Northwest extension of "Soo" Line. (See July 21, page 557.)

British Columbia.

Burrard Inlet & Fraser Valley.—Under survey and partly located from Sumas City, Wash., north to Vancouver, 47 miles; tenders called for a portion of the road. Road projected in interest of the Northern Pacific. (See March 3, p. 178.) C. D. Rand, President, Vancouver, B. C.

Kaslo & Slocan.—Kaslo, on Kootenai Lake, west to Slocan mines, about 30 miles; contract let. Road will be operated by Canadian Pacific. D. J. Mann,, of Victoria, and J. Hendry, New Westminster, B. C., directors.

Nakusp & Slocan.—From Nakusp, on Lower Arrow Lake, to the Slocan mining district, 30 miles. D. McGillivray & Co., of Vancouver, B. C., contractors. Road will be operated by Canadian Pacific.

Spokane Falls & Northern.—Track laid in 1893 from Northport, Wash., to International boundary, 10 miles. On Nelson & Fort Sheppard.—Under contract and construction from International boundary north to Nelson, B. C., 60 miles; P. Larson & Co., Sayward, B. C., contractors. (See March 24, p. 235.) D. C. Corbin, President, Spokane, Wash., and E. J. Roberts, Chief Engineer, Spokane.

Victoria & Sidney.—On Victoria Island, from Victoria to Sidney, 11 miles; contract let to P. W. Patterson, of Victoria, B. C. (See Feb. 24, p. 160.)

MEXICO.

Mexico, Cuernavaca & Pacific.—From City of Mexico to Contreras, about 20 miles graded and some track laid. Contract let to Wilson & Casad, of City of Mexico. Surveys made to Pacific coast. (See May 19, p. 385.) J. H. Hampson, President; D. B. Smith, General Manager, City of Mexico.

Mexican Northern.—Under construction from Sierra Mojada to Encantada mines, 3 miles; D. Shaw, Jimenez, Mexico, contractor V. P. Safford, Superintendent and Chief Engineer, Escalon, Mex.

Mexican Northern Pacific.—Partly graded from Deming, N. M., south to state line, 80 miles. Projected through northern Mexico to Pacific coast. Huss, Townsend & Co., Chicago, contractors. J. T. Smith, Chief of Construction, Deming, N. M.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Chief engineers, managers and superintendents of railroads who visit the World's Fair ought, before going there, to look up the description of the Edge Hill yard Liverpool, which appeared in the *Railroad Gazette* of April 15, 1887, and then examine the model of this yard which is shown by the London & Northwestern Railway. We have had frequent occasions to refer to this yard since the first description was published, particularly in reviewing the books of Sir George Findlay and Mr. Acworth, "The Working and Management of an English Railway" and "The Railways of England." If the files of the *Railroad Gazette* are not accessible, good descriptions of the Edge Hill yard can be found in both these books, but particularly in Findlay's. The arrangement is one that has suggested a good deal to American railroad officers, and while it has nowhere been exactly copied, it has affected what has been done in a number of instances. It is a remarkably fine example of a great freight yard worked by gravity, and is especially remarkable as the first large, systematic and complete attempt to sort and make up trains by gravity alone. Indeed we suspect that it still remains the only yard where no other power is used. We have had the opportunity to describe several American gravity yards in the last few years; but in all of them engines are still freely used. The Edge Hill yard was designed by Mr. Harry Footner.

Since the Manhattan Railway Company has declined to undertake, for the present, any scheme of extensions, the doctors are raking up again all the old plans that have been brought forward and thrashed out. Among others, naturally, the idea of a very deep tunnel again comes up, and one of the most respectable and responsible of the New York daily papers says that the opposition to this plan of providing rapid transit for the city is "based on ignorance and malice." We suggest that this is neither argument nor courtesy. It happens that a good many engineers of very high standing, both as to professional capabilities and as to character, have opposed the deep-tunnel idea on purely scientific grounds. If the matter is to be gone over again by the press, it would be well to remember that the London experiment with a deep tunnel is a plaything compared with what must be done in New York. It carries about one-fortieth as many passengers as are now carried on the elevated railroads of New York City. The first three half years that it was worked it paid no dividends on the common stock. The second half of 1892 it paid at the rate of five-eighths of one per cent. per annum, and the first half of 1893 it paid at the rate of three-fourths of one per cent. That is, at the end of two and one-fourth years, it had begun to earn dividends of less than one per cent. per annum. The operating expenses in the last half year were 65 per cent. of the gross earnings, against 50 per cent., nominal, for the elevated railroad system of New York. Of course we do not contend that all this proves that the City & South London is a failure; but we do contend that it is not such a mechanical and commercial success that it can be taken as a precedent for New York. A man who thinks of investing in a similar scheme in New York will be a fool if he does not analyze it very thoroughly, even at the risk of being called ignorant and malicious.

On another page appears a list of railroad enterprises which are in various stages, from preliminary survey to actual tracklaying. As is suggested elsewhere we have taken pains to exclude such as appear not to have passed somewhat beyond the first stages of promotion and to include only such as have some chance of being carried forward when the financial situation improves. Naturally a good many enterprises, which had fair prospects only a few months ago, are now entirely suspended; and however good may be the reasons for building each one of the lines named in this list, much the larger part of them must now be delayed, and many of them will be delayed a good while. The chief value of the list will be, we take it, to engineers and and contractors. To them it will indicate where work is to be done, sooner or later. To the general student of railroad extension this showing will have little value. Incidentally it is interesting to note the absence of long lines, the preponderance of branches to take old roads into new fields, and the number of enterprises in old and rich Pennsylvania and the entire absence of them in Iowa and Kansas. In the latter states the lawmakers have made capital unsafe, and the next step is to try to get railroads built by the states—that is, to take money from the people by force to build railroads that cannot pay. We doubt very much, however, if even in Kansas the fundamental common sense of the people who pay taxes will permit the demagogues and the dreamers to go to such a length.

The superintendent of an excellently managed Western road criticises, in another column of this issue, the views of another correspondent, "Langdon," concerning the uselessness of torpedoes. We shall not undertake to defend Langdon, for the truth in his letter needs no defense, and the other portions may have been intended, more or less definitely, to pass for flowers of rhetoric; but we will call attention to one or two points which R. E. L. deems obscure, but which we think are not. Langdon's experience was probably among the enterprising men of the West during the first part of the quarter-century; of late years he has been with the old fogies of the East. But perhaps he is not so culpable in ignoring the torpedo placer and the self-destroying torpedo. In the night the former would seem to be open to the objection that the brakeman cannot have ocular evidence that the placing has positively been accomplished; and the self-exploding signal ought not to be recommended as a substitute for an expensive signal without a statement as to the cost of the substitute itself. The strong predilection in favor of simplicity, which is so prevalent among railroad officers, is doubtless one great reason why fusees are in more general favor than these other devices. Langdon is, of course, "wandering from the point" when he speaks about the value of signals which can be seen in advance by men on top of the train; but the allusion reminds us of a wideawake freight conductor of our acquaintance who tells of cases in which he has seen red flags and got his train well in hand before the engineman awoke to the occasion sufficiently to blow the whistle. The *Railroad Gazette has* sympathized with some people who are "discontented with existing things," for their conditions were not imaginary; though at the same time it has not failed to recognize that on such good roads as R. E. L.'s the high state of discipline permitted the continuance of old methods. But the contest between the space interval and the time interval systems does not all hinge on discipline. Even R. E. L. would probably admit *some* absurdity in the flagging system if he were the engineman of a fast train on, say, the Pennsylvania road between Newark and Jersey City, where there are six main tracks parallel to each other, and where, on the curve, he might encounter two red lights, neither of which was meant for him, and yet which, according to the rules, he would have to heed, and probably shut off steam for, until he could be sure that neither one was on his track.

Reinforced Brakes.

One of the most important of the probable improvements in air-brake practice, so far as can be foreseen now, is an arrangement by which the initial pressure on the brakeshoe will be increased, to be reduced as the speed declines. This is not only the next great step to be taken, but it is one that is likely to be taken very soon, and yet it is not wholly certain that anybody has conquered its difficulties. A few months ago (December, 1892) we told of the experiments making in this direction by the Westinghouse Air Brake Company, at Altoona, when it was found that at 60 miles an hour stops could always be made with the reinforced brake in from 70 to 75 per cent. of the distance required to make the stop with the best quick-acting, automatic brake not reinforced. At that time complete success seemed very near; but so far as we are informed now, the Altoona experiments of that time were but a stage in development. We believe that the Westinghouse people are now pretty confident that they have arrived at a practical working means of accomplishing this immensely useful purpose, and we hope they have, and are prepared to believe so.

And yet, modifications in the brake apparatus itself are only a part of the changes that must be made in order to use a very high brake pressure at high speeds. A great increase of brake pressure must be accompanied by a thorough overhauling of foundation, brake-rigging and of the details of construction of trucks. An increase of 100 per cent. over the maximum brakeshoe pressure now used will bring strains upon these parts which the present construction is not fit to carry. This part of the difficulty is, however, a subordinate one. When a practical means is developed of reducing the brakeshoe pressure, parallel with the reduction of speed, and when as a consequence much higher initial pressures are used, the change in design and construction of car details will be made with comparative ease; that is, the modifications of brake rigging and trucks, while not without troublesome details, will be comparatively a simple matter.

Meantime, it is a fact that the Westinghouse reinforced brake arrangement is now in use on the Empire State Express on the New York Central & Hudson River, and the results obtained there will be looked for with the keenest interest, for they will be of very great value in developing what we have said is the next stage in air-brake progress. So far, we are told, the apparatus has worked successfully.

The Westinghouse plans of reinforcing the braking power are to increase that power by raising the pressure in the train pipe or by increasing the size of the brake cylinders, and then to provide automatically for a reduction of the increased brake force to the normal brake force within a specified time. The former is the principle on which the work on the Empire State Express has been carried out. The train pipe pressure has been increased from 70 lbs. to 100 lbs., or about 43 per cent. A pressure reducing and retaining valve has been added, the operation of which is such that in service applications the service pressure cannot be exceeded; that is, the discharge port in this valve is larger than the passage leading from the auxiliary reservoir to the brake cylinder. But in an emergency application the inflow of air to the brake cylinder forces this escape valve past its position of larger opening to a position to open a smaller escape port, but one sufficiently large to provide for the reduction of pressure to the normal in about 15 seconds. In ordinary practice, with 70 lbs. in the auxiliary reservoir, the emergency pressure in the brake cylinder is about 60 lbs.; but with 100 lbs. in the auxiliary reservoir an emergency pressure in the brake cylinder of 80 lbs. is obtained, an increase of 67 per cent.; which shows the increase in brake power in the new arrangement on the Empire State Express.

Mr. Westinghouse long ago determined that, with brakes in the best possible order, acting on all the wheels and up to their theoretical efficiency, it was possible to reduce the speed at the rate of three and a half miles an hour for each second; but "with the brake force as now fitted to trains, the reduction of speed of trains running above 60 miles an hour would, under favorable conditions, not exceed two miles for each second." (See *Railroad Gazette*, p. 697, 1892.) Let us assume that with the reinforced brake the speed can be reduced at the rate of two and a half miles an hour a second. The Empire State Express sometimes runs at 80 miles an hour, frequently at 70 and for considerable distances at 60. Then at the end of 15 seconds, when the greater brake pressure would cease, the speed would be 42½, 32½ and 27½ miles an hour, respectively.

An incidental advantage of the reinforced brake, which is considered by Mr. Buchanan of great importance, and has been much appreciated by the engineman running the train, is that with this high initial pressure in the auxiliary reservoir they can get at least three full service applications without recharging the auxiliary. Thus, an engineman running under a distant signal and applying brakes and then releasing, still has pressure enough left to stop at the home signal;

that is, he has sufficient pressure for an emergency application, if necessary. In this actual application of the new reinforced brake, the pressures would be about as follows: The first full application would reduce the pressure in the auxiliary reservoir from 100 lbs. to about 85 lbs., giving 60 lbs in the brake cylinder. Second reduction from 85 lbs. to 70 lbs. would again again give 60 lbs. in the brake cylinder. A third reduction of 15 or 20 lbs. would give a brake cylinder pressure of about 50 lbs., the usual service brake pressure. On the Empire State Express the brake cylinder pressure is, as we have said above, regulated at 60 lbs. Of course, it is understood that in these successive service applications the engineman must not reduce the train pipe pressure more than is necessary to get a full application, for if he does the result will be simply to allow the surplus reservoir pressure to escape from the relief valve. A telltale from the relief valve on the locomotive into the cab will probably be provided, if it has not already been, so that the engineman can know when the train pipe pressure has been reduced to a sufficient degree to get full service application.

The train that will be tried on the Pennsylvania will be fitted with large cylinders, so as to give about double the normal braking force with 70 lbs. train pipe pressure. Obviously, this has the advantage that the cars so fitted up can run in regular trains, and their presence in a train will not interfere with the normal operation of the brakes.

A Sketch of European and American Railroad Signaling.

The paper on Railroad Signaling which was prepared by Mr. G. Kecker, German Imperial Railroads, Strasburg, for the International Engineering Congress, has a certain use, but that use is very limited and too much should not be looked for. In 52 octavo pages of large print Mr. Kecker undertakes to give us the principles and practice of signaling in general; the kinds of apparatus for conveying information and a condensed description of the operating apparatus. All of this he tries to do not only in general, but in detail, and for England, France, Germany, Italy and the United States, and he sets out to give various scraps of history besides. Naturally all of the paper is superficial, some of it gives wrong impressions and some is actually erroneous. Still, as we said, the paper has a certain use. It concentrates in view so much of the world's practice that the reader can get a fair general notion of what has been done and some hints of what is now doing, and can ascertain certain directions in which to look further.

The reader's chief difficulty as regards facts will come from the circumstance that Mr. Kecker has accepted published accounts of pure experiments as records of service, and has therefore given undue prominence to devices of little merit. For instance, an American invention which never came into use is described in such a way that the uninformed reader is likely to regard it as an important and useful feature of American practice; though in general the paper gives a pretty fair view of such American signals as it touches upon, although the practice of the Pennsylvania in block signaling, the oldest extensive block signaling in America, is not mentioned. There are indications that this insufficiency of the author's information applies to other countries, except, perhaps, Germany. It is stated that green has been substituted for white as an all-clear color in English fixed signals, but from the Clearing House code and other sources we understand that white is still the all-clear signal light, and that green has been adopted by only two or three companies.

We give below some running notes on the paper, in which we endeavor to show its salient points, but those interested in signaling will do well to get copies for themselves. It was presented in Division A and will appear in the *Transactions* of the American Society of Civil Engineers.

Mr. Kecker divides his paper into six parts. (1) General; (2) Application of fixed signals; (3) The train staff; (4) Block signaling; (5) Interlocking apparatus, and (6) Miscellaneous.

The first chapter gives a few scraps of history, the chief of which is that a congress of English railroad men at Birmingham in February, 1841, established some of the cardinal principles of railroad signaling as now practiced. This congress decided that red should mean danger, green caution, and white safety, and that the normal position of a signal should be at danger. The reason given for choosing white, red and green in the order named is that this is the order of their values according to their visibility, but the author does not give any historical data for this conclusion, and it would seem that he ignores the fact that in night signals red *combines* a good degree of visibility with the most decided distinctiveness as compared with ordinary white lights. The reason that green is the only other color in general use is that it is the only one which has fair visibility and which is also sufficiently distinct from red and from ordinary lights, which we call white lights, but which actually are yellow. Mr. Kecker says that while green is used to indicate all-clear in fixed signals, it is still used to indicate caution in hand signals, but that the disadvantage is only theoretical. Illuminated signal blades have been much experimented with, especially in France, but it does not appear that any one has had any better success than the American experimenters in this line, whose work is well known to the readers of the *Railroad Gazette*.

For operating signals, rods from 1¼ to 1½ in. in diameter are no more expensive than wires up to distances of 550 ft. In Germany several accidents have been caused by mischievous tampering with signals operated by a single wire, and it has become the general practice there to use double wires on this account. The only compensators for long wires noticed by the author are those used in France and in Germany; in the former the end of the wire farthest from the signal passes over a roller and is weighted to keep it in uniform tension. The movement of the signal lever clamps the wire and carries it along; when the lever is reversed the wire is automatically released. In Germany, with double wires, the essential feature of the compensator is to have both wires strained equally by equal weights hung upon them at the middle, so arranged that a change in the stress of either wire automatically clamps the weights and allows the signal to be operated.

Under the head of "electrical throwing apparatus," various devices used in Austria-Hungary, Switzerland and France are mentioned, but nothing is said about the extent to which they are used. Various fog signals are mentioned; the apparatus used on the New York elevated seems to be the best. In France and England a variety of "telltales" for informing a signal man of the position of a signal which is out of his sight are used. Indicators for assuring the operator that a light is actually burning are also mentioned, but nothing is said as to where they are to be found.

Mr. Kecker calls the distant signal a characteristic of the English system. Where there are several diverging tracks, the blades are arranged from top to bottom, so as to correspond to the tracks from left to right. This is the opposite of the rule which obtains in America, where more than two arms are placed on one post. The Belgian signal system is much like the English, but the distant signals are generally disks. In France, the distant signal is also a disk, but the roads in that country are still operated mostly by the time interval system and "France is the country in which the fewest experiments have been made in signaling." The French distant signal shows a red light when it is against the train at night; the rule under which it is used is, however, more sensible than the English, as it only requires the runner to proceed cautiously, so that he can be able to stop within the length of track in sight, whereas the general rule in England is to require the runner to be able to stop *at* the distant signal. At junctions the French roads have a distant signal consisting of a box, presenting in white letters on a green field the word *Bifur*. This gives the same indication at night as in the daytime. The lamps on the switch stands of facing point switches have violet lights.

The lack of political unity in Germany produced a great diversity in many things, including signals, but this has been reduced by the German Railroad Union, and a new code of signals was adopted Jan. 1 last. The substance of this code was printed in the *Railroad Gazette* Oct. 21, 1892. In early days the Germans experimented with semaphore signals which could be seen from one another, and these were used to some extent; but they were superseded by the Morse telegraph, which is now general. There are few German switchtenders who are not familiar with the use of the Morse apparatus. At distant signals green indicates danger, the Germans adhering strictly to the rule that an engineer shall never run by a red signal. To indicate safety the arm is pointed obliquely upward to the right. Mr. Kecker holds that in general a signal need not be over 10 to 13 ft. above the ground; at this height the engineer can see it distinctly, even in a thick fog. He finds that the distance of a distant signal from the point to be protected is everywhere varied according to grades and speed of trains and to the brake power. In England, he says, it is generally from 1,300 to 2,600 ft. (Our impression is that there are a good many which are more than 2,600 ft. distant. In France the distance is 1,200 to 2,600 ft., but on account of the increase in the speed of trains without an increase in the number of brakes the French have increased the distance to 3,300 ft. to 4,000 ft., and even in some cases to 6,500 ft. In Germany of late a distance of 2,000 ft. "has generally been assumed" as the distance in which a train may be stopped.

The credit of first proposing the block system is accorded to W. F. Cooke (England, 1842). Cooke used needle telegraph instruments and applied his system in 1844 on the Eastern Counties road, but he met with opposition, and not much progress was made until the needle apparatus of Edwin Clarke was introduced on the London & Northwestern, in 1853. The characteristics of the English block telegraph apparatuses are briefly described. Tyer's apparatus, patented in 1852, is extensively used in France, as well as in England. In Germany the Morse printing telegraph instruments are generally used for block signaling; the Germans at the outset adopted an apparatus devised by Mr. Frischen, of the firm of Siemens & Halske, for interlocking the telegraph apparatus with the outdoor signals. With this apparatus the electric current is generated by a Siemens alternating-current machine. Each change of a block signal requires 21 alternating currents; hence, the signals are independent of the effects of atmospheric electricity. The Hall and the Union automatic systems are briefly described, but the author's information is not in all cases up to date. He also refers to the "American Pneumatic Signal Company," without saying that its apparatus has failed to find favor. In speaking of Black's block system, used on the New York elevated roads, the signals are credited with protecting the great traffic of Oct. 10, 11 and 12, 1892, the author being evidently ignorant of the fact that the weather was perfectly clear on those days, that the block signals are not always used in clear weather, and that on some of the busiest parts of the Manhattan lines they are not used at all.

Mr. Kecker's chapter on interlocking is the longest in his paper, and he discusses the relative merits of English and German ideas at considerable length. Switch and signal levers were concentrated by the English as early as 1846, but the first conception of interlocking is credited to Saxby, in 1856. The principle had, however, been employed before, in an apparatus making it impossible to clear a signal except by the concordant action of two signalmen. In England the law forbids the operation of a facing point switch more than 540 ft. from the tower, and of a trailing point more than 900 ft. In Germany interlocking (Saxby & Farmers) was first introduced in 1870, and the Germans have gone to great expense to put all the towers (generally two) at a station directly under the control of one stationmaster or yardmaster; they even duplicate some of the interlocking apparatus for this purpose in the stationmaster's office. This connection was formerly accomplished by electric apparatus, but mechanical means are now in most favor. To lock the entire route of a train through a yard, special "route levers" are used. The Germans criticise the English signal engineers for using so many levers, and Mr. Kecker says that Max Jüdel & Co., of Brunswick, Germany, make apparatus in which a crossing of two double track roads, with two switches, two double armed entrance signals, two distant signals and four departure signals, is operated by only four cranks, wires being used to throw the switches.

The Germans generally operate a distant and a home signal by the same lever, the custom being, apparently, to pull off both together; when the distant signal cannot be cleared, the home signal is not cleared until the train passes the distant and gets within control. Detector bars are seldom used in Germany. The hydraulic interlocking apparatus of Bianchi & Servettaz, of Italy, is referred to as having been tried on the Italian-Mediterranean Railroad, but still it is spoken of as "yet to be tested by practical operation." Mr. Kecker refers to the report of Messrs. F. Büte and von Borries on their visit to America in 1891, and on their testimony awards the palm to American interlocking, especially the electro-pneumatic system, under which trains can follow each other at very short intervals. With the English interlocking system the shortest interval at which trains have been run is two minutes, "on account of the greater power necessitated by the use of rods for transmission." Mr. Kecker forgets that the superiority of the American system is largely due to the adoption of the automatic principle, by which very short block sections are rendered financially practicable. In Germany, says the author, the movement of trains must be considerably slower than in England, because of the complicated process of announcing trains.

Under the head of miscellaneous signals, Mr. Kecker refers to the great diversity of switch-stands in Germany. He says nothing else about switch-stands except to refer to an old-fashioned pattern made by the Pennsylvania Steel Company. There is in use in Germany a "drilling clock" for communicating between a yardmaster's office and a signal tower. It is not clear whether the connection is mechanical or electrical, but the principle seems to be the same as that of the apparatus used at the Erie station in Jersey City. Our author regards bell cords and similar train signals as "emergency signals." An electric train signal is spoken of as common in France, the battery being placed in the brakeman's compartment. The need of a signal by which a disabled train, remote from a station, can ask for help, is referred to and "the continuous electric block signal apparatus such as is found throughout Germany and Austria" is spoken of as affording a convenient means for a special apparatus for this purpose. Apparently, special apparatus, to be carried on a train for sending signals over an electric wire, is considerably in use in the countries named.

We have given what seem to us the most valuable parts of this monograph, but as we intimated at the outset the subject is treated in a superficial way, and it is therefore not always possible to decide what statements are valuable and what are not. The general absence of accurate data as to the extent to which any particular apparatus or device has come into use is the most prominent defect of the paper.

The proper operation of a railroad, a business in which the responsible commander cannot see with his own eyes much of what is being done under his supervision, demands inspectors, who shall devote their whole time to inspecting. This need is very often ig-

nored, more or less, but it was spoken of by Col. H. S. Haines in his recent "World's Congress" paper on railroad accidents, and the importance of meeting it was there clearly set forth; and it is again illustrated by a circular recently issued by a division superintendent on a prominent road, enjoining upon conductors and enginemen the importance of restricting the use of the locomotive whistle. The occasion of this circular was not any official report received by the superintendent, nor had he observed any excessive whistling so far as appears from the circular, but "complaints from prominent citizens and official notice from public authorities" were what aroused him. Possibly this superintendent adopted this form of appeal so as to show to his subordinates the tender side of his heart—so as to intimate to them that, personally, he would not object to their noise; but the wording of the order so clearly implies approval of any degree of misconduct that shall escape being complained of that it must tend, in the long run, to weaken discipline. This matter of noise is peculiarly one which cannot be left to the judgment of enginemen, for not more than one in twenty of them will put himself in the other fellow's place. The superintendent should know, of his own knowledge, or from intelligent inspectors, about how much whistling is necessary for safety at each yard and crossing, and then permit only that amount; for if it were not for the requirements of safety, every resident near a railroad would have a right to demand the entire abolition of the steam whistle. Mouth whistles will answer for switching purposes. There is no telling just how much credit for himself or his road a superintendent gains by abating nuisances before people complain, instead of after, but it is patent to every one that a dilatory course promotes unfriendliness on the part of the public, and the wisdom of an opposite course should require no argument. While on the subject of the whistle nuisance we wish once more to remind about a hundred superintendents, whom we could name, that most of their enginemen make the highway crossing whistle signal about twice as long as it ought to be made. For the four blasts they take from two to four seconds or longer, when from one to two seconds is ample time; and the shorter signal is more effective. A person in an otherwise quiet locality experiences far less annoyance from 100 trains a day which inflict upon him 100 seconds' noise than from the same number of trains trying to split his ears for 400 seconds in the aggregate.

One of the London & North-Western passenger cars exhibited at the World's Fair has a destination board or label fixed in brackets on its side, which is a reminder of the fact that most American railroads manage this detail in a somewhat slovenly manner. The English placard is a board about 3 in. wide and 16 in. long, bearing the single word Euston or London, or Liverpool, as the case may be. It is the perfection of neatness and appropriateness (unless perhaps it is a trifle too small), while our fashion goes to the other extreme. In union stations, and other places where the most suitable place for a destination card is on the side of the car, one sees large pasteboard cards, 18 in. to 24 in. long, the chief characteristic of which is shabbiness—a white ground, considerably soiled, and ragged edges. The lettering is often more notable for its exhibition of the poor taste of the job compositor who set it up than for legibility. The use on a destination card of railroad trade marks, made up of complex designs in several colors, is in poor taste, unless the trade mark is very small in proportion to the size of the card. People hunting for the right train do not wish to study art or advertisers' cuteness; they can do that at their leisure by the aid of a folder after they find their seats in the cars. In large terminal stations the arrangement of signs to show not only the destination of a train, but all the stations at which it stops, is very well attended to by American roads, though even here opportunities for improvement are not wanting. It is regrettable, however, that no two station masters have ever had the same ideas, so that a passenger has to adjust himself to some differences of treatment of this matter at every large station he enters. Movable signs which are of such a permanent character that it pays to have them painted, should have a black ground with light colored letters, so that the dirt which accumulates from handling will not disfigure them. In the Grand Central Station, New York City, the signs which are attached to the cars have fittings by which they are fixed in the tail-light brackets on the corners of the cars. This keeps the signs always above the heads of a crowd, and as they hang at right angles to the track they are always conspicuous. There would be no difficulty in using these brackets to support signs to face across the platform, or at any desired angle.

The principal news items printed during the past week in reference to retrenchment on railroads have been those referring to additional discharges of men or reductions of wages on roads which had already taken more or less radical action. This applies to a large number of prominent roads, and is probably true of nearly all, though many details doubtless fail to get into print. On Aug. 17 the Pennsylvania shops at Altoona were ordered to run upon half time, half of the men working one week and the other half the next. The Cleveland, Akron & Columbus has reduced wages 10 per cent., the order stating that the reduction is temporary. The Detroit, Lansing & Northern and the Chicago & West Michigan have made a reduction of 10 per cent. in the pay of all men receiving $50 a month or over. The Pittsburgh, Fort Wayne & Chicago has taken one man off of each train crew, both passenger and freight. A Pittsburgh paper states that way passenger trains will hereafter have but one brakeman and through passenger trains but two. The Louisville & Nashville seems to be having a protracted negotiation with its men concerning a proposed 10 per cent. reduction. According to the press dispatches the employees refuse to accept the reduction and offer to lend the company a part of their wages for three months without interest. The Mobile & Ohio has reduced all salaries of over $50 a month, the reduction varying from 7½ to 20 per cent. The Missouri Pacific has taken off a passenger train between St. Louis and Sedalia. The receivers of the Northern Pacific have ordered the following reductions: On salaries from $1,200 to $5,000 10 per cent.; salaries from $5,000 to $10,000 to be reduced 15 per cent., and salaries above $10,000 to be reduced 25 per cent. The Southern Pacific on Tuesday of this week sent out a stringent order requiring retrenchment everywhere, in addition to that ordered two or three weeks ago. Forty-five boiler makers at the Baldwin Locomotive Works struck when their pay was reduced, but since then the company has suspended about 400 men and will probably suspend more. Some of the departments of these works will run only five days in a week. The Harlan & Hollingsworth Co., of Wilmington, Del., is running four days a week and has discharged some men.

The half-yearly reports of the English railroads for the first half of 1893 showed an increase in gross revenue of about ¾ of 1 per cent. and of working expenses of less than ¼ of 1 per cent. The increase in net revenue, therefore, amounts to £217,000. During the year, however, fixed charges increased about 1.2 per cent., which left available for dividends on common stock only about £100,000 more than was available in the first half of 1892. But common stock was increased £4,900,000, or about 3.4 per cent., and the dividends were decreased slightly; for the half year they were at the rate of 3$\frac{1}{16}$ per cent. per annum as compared with 3⅛ per cent. in the first half of 1892. This is the lowest rate of dividend paid since 1887, when it was 3⅛ per cent. The chief increase in gross revenue was from passenger traffic, the freight earnings being less than in the first half of 1892. The length of line operated was 112 miles more than in the previous year; but the train mileage run was 400,000 miles less. The price of coal was less and the cost of material for repairs and renewals was considerably less, but wages were higher than in the preceding year.

NEW PUBLICATIONS.

The Kensington Series.—Various papers by different writers on railroad subjects published within the last few years are to be collected and published under the name of "A Compendium of Transportation Theories," by the Kensington Publishing Co., Washington, D. C. The price of the first volume will be $2.00. This volume will be published under the supervision of Mr. C. C. McCain, Auditor Interstate Commerce Commission. It would be impracticable to give the table of contents, but the papers will include three by Judge Cooley, four by Judge Schoonmaker, two by Senator Cullom, two by Colonel Walker, two by General Alexander, and others by writers of more or less consequence in this particular field.

TRADE CATALOGUES.

Standard Apparatus of the Westinghouse Electric & Manufacturing Co., of Pittsburgh, is the title of a 60-page album which has been issued by the company named, apparently for circulation at the World's Fair. It consists wholly of full-page illustrations in the elegant style of Bartlett & Co., of New York, whose work is familiar to our readers. Persons desiring explanation of the different apparatus shown are requested to ask for descriptive pamphlets. The machines shown are generators of numerous types and sizes switchboards, converters, meters, etc.

Locomotives at the World's Fair—Rogers Locomotive Works.—The catalogue describing this exhibit tells a very brief story of the development of the Rogers Locomotive & Machine Works, and contains perspective and line drawings and dimensions of three different locomotives shown at Chicago. The works were established in 1831 and from 1832 until 1836 were carried on under the firm name of Rogers, Ketchum & Grosvenor. In 1856, Thomas Rogers died and the works were reorganized under a charter as the Rogers Locomotive & Machine Works, with J. S. Rogers, a son of Thomas, as President. This organization lasted up until 1893, when the company took the name of the Rogers Locomotive Company, with Robert S. Hughes as President and Reuben Wells the Superintendent. The "Sandusky" was the first locomotive built by Thomas Rogers, in 1837.

Railroad Matters in Chicago.

Freight Traffic.—The deliveries of grain by eleven Western lines for the past week showed 3,520,000 bushels, against 3,706,000 the preceding week, and 5,874,000 bushels the week ending Aug. 20, 1892. Shrinkage on flour and miscellaneous freight compared with the same week last year aggregated 16,961 tons. The live stock traffic made a better showing, a slight decrease in cattle being more than compensated by a material increase on hogs and other stock. The outlook for future business is materially improved by advices from the corn districts, which report the crop prospects as very satisfactory, except in a few isolated sections, and surplus of old crop liberal.

The outward movement of merchandise freight was also light compared with a year ago, but at the close there were a few pronounced evidences of an improved jobbing trade in leading descriptions of goods. Interior merchants who were in the city the past week stated that there was a growing feeling of confidence in nearly all directions. The stocks of goods in retailers' hands are low, and the improvement in the corn crop has inspired confidence in all sections where that grain is the chief reliance of farmers.

The following shows the receipts of grain and flour at Chicago by twelve Granger railroads for the week ending Aug. 19, and same time in 1892, and the amount delivered by each line:

By—	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls.	Bush.	Bbls.	Bush.
C. N. W.	8,627	449,000	13,407	609,000
Ill. Cent.	600	616,000	2,100	925,000
C., R. I. & P.	5,750	497,000	4,750	748,000
C., B. & Q.	11,167	838,000	26,168	1,248,000
C. & Alton	7,525	259,000	8,970	526,000
C. & E. Ill.	300	167,000	125	333,000
C., M. & St. P.	16,825	188,000	25,925	479,000
Wabash	600	215,000	4,925	283,000
C. & G. W.	10,445	140,000	39,571	233,000
A., T. & S. Fe	......	131,000	244	417,000
Wis. Cent.	272	......	750	......
L., N. A. & C.		20,000	......	73,000
Totals	62,111	3,520,000	126,935	5,874,000

Passenger Traffic.—The improved passenger traffic, which was the feature of last week, was more pronounced during the one just closed. Every road entering here participated to a greater or less extent in the enlarged business, and although none found their trains overcrowded, the most popular lines had their cars well filled. An evidence of the increased travel is seen in the attendance at the World's Fair, where the paid admissions for the six business days ending with and including Aug. 19, aggregated 782,172, an increase of 121,799 over the week ending Aug. 12, which, omitting the opening week, was larger than any corresponding number of days. While the business of the Western roads increased since the first of the month, earnings have not been in proportion. An officer of the Chicago, Burlington & Quincy said: "We are hauling a good many more passengers than at any preceding time this year, but our revenue does not show proportionate results. On the reverse, our passenger earnings since Aug. 1, when reduced rates were put in force, have averaged $5,000 per day below our June receipts." Interviews with the officials of other roads called out like statements, all the leading lines being opposed to a further reduction in rates.

CHICAGO, Aug. 22.

International Electrical Congress.

The International Electrical Congress opened its sessions in Chicago Aug. 21 with the greatest attendance of electrical experts, probably, that ever met together. There were present Dr. H. von Helmholtz, Mr. Alex. Graham Bell, Mr. Silvanus P. Thompson, Mr. Elihu Thomson, Mr. Thomas A. Edison, Mr. W. E. Ayrton, Mr. E. E. N. Mascart, Mr. W. H. Preece and other well known electricians. Probably the papers alone would not have called together such a large number of distinguished specialists, but great importance is attached to this congress as various national governments have sent their greatest electricians to confer and perhaps agree upon a common electrical language to be used throughout the world.

The congress was divided into two branches, before one of which the papers were read and discussed. The other, the chamber of deputies, composed of representatives sent by the several governments, was to consider the following topics: Adoption of definitions and values of fundamental units of resistance, currents and electromotive force; adoption of definitions and values of magnetic units; adoption of definition and value of the unit of self-induction; definitions and values of light, energy and other units; the standardization of electrical lights; the consideration of an international system of notation and conventional symbols, and of a more uniform and accurate use of terms and phrases in electrical literature; and a commercial standard of copper resistance.

The session of Monday afternoon was occupied mostly in effecting a permanent organization, during the course of which the large audience applauded frequently that great scholar Dr. H. von Helmholtz. Other speeches were made, that by Prof. W. E. Ayrton, F. R. S., of London, on "A Foreigner's Impressions of the Electrical Exhibit at the World's Fair," attracting most attention. The substance of his remarks was that the "stranger," as he preferred to be called, having arrived on the coast and having been shown the laboratories of Pittsburgh, Cleveland and other cities, and the displays of city and

town lighting and urban and inter-urban transportation by electricity, is indeed disappointed in the exhibit in the Electricity Building. He compared the electrical exhibit at the Chicago Exhibition with the one at Frankfort, stating that, whereas in the latter place the exhibit was all inside the building, in the former case the real electrical display is scattered throughout the country, and the electrical engineer finds much of interest wherever he goes. He thought the finest electrical display was in the "Court of Honor."

At the meeting on Tuesday, Mr. W. H. Preece, F. R. S., engineer to the London postal telegraph, read a paper on "Signaling through Space by Means of Electromagnetic Vibrations." He described, at some length, a series of experiments conducted in the Bristol Channel to find if it were possible to communicate between the land and lighthouses and lightships without the usual metallic connection between the points. It was found that messages could be intelligibly communicated a distance of three miles out, and that the line on the land, which carried the exciting current, and the one on the island or boat must be parallel and at least as long as the perpendicular distance between the lines. To signal over the three miles where the experiments were made, an alternating current of 140 volts and 15 amperes was used. It was found that this current was not sufficient to signal a distance of five miles with the length of wire used in the line stretched on the mainland and the one on the island. The conclusion deduced from the experiments was, that while it were possible to transmit signals through space by means of electro-magnetic vibrations, it was not much cheaper than to make direct metallic connection with the lightship or lighthouse and the land, and this was being done. In the discussion of the paper it was told how the Lehigh Valley Railroad had used the same principle in signaling from moving trains to stations.

Dr. Silvanus P. Thompson, F. R. S., read a paper on "Ocean Telephony," in which he described a cable, which, he claimed, *if* used *in* trans-Atlantic work, would do the work now needing eight cables. In the present cables the slowness with which the insulation around the copper wire changes from low to high and from high to low potential limits the number of words that can be sent to about 25 a minute, as claimed by the Postal Cable Company. Were the cable made with two wires, one for the outgoing current and one for the return current, with induction coils connecting the two so as to produce a slight leakage from the outgoing wire, these induction coils, placed uniformly ten miles apart, such a cable would transmit signals so much more rapidly that, in his judgment, ocean telephony would be possible, or, if not, then at least the Morse signals could be sent so much more rapidly that one cable would do what now requires eight. Dr. Thompson showed several illustrations of how he would construct such a cable.

New England Roadmasters' Association.

The eleventh annual Convention of the New England Roadmasters' Association opened at the American House, Boston, Aug. 16, President C. B. Lentell in the chair. Officers for the following year were elected, namely: President, G. L. R. French, Boston & Maine; Vice-President, R. P. Collins, New York, New Haven & Hartford; Secretary, E. E. Stone, Boston & Albany. Executive Committee, C. B. Lentell, F. E. Sibley, S. B. Bodwell, J. W. McNamara.

The first report presented was that of the Committee on the Best Method of Relaying Rails in Main Track. The recommendations of this Committee were that rails be carefully unloaded; that on curves sharper than two degrees they be bent by a machine; that the rails be bolted together on the ends of the ties ready for use in as long sections as the intervals between trains will allow handling; that adzing, spike-pulling and loosening of old bolts be done in advance, so far as it can be safely done; that the foreman and the train dispatcher should co-operate to secure the greatest economy of time; and in fact that various other things should be done which everybody knows ought to be done. Little discussion was had, but a committee was appointed to formulate answers to 10 questions appended to the report. Probably it will be sufficient to state the answers to these questions without stating the questions. The Committee recommended that old ties, if of suitable size and sound, should be allowed to remain under new joints; old spike holes in good ties should be plugged; old track relaid should in ordinary cases be raised enough to give all ties an even bearing; the maximum degree of curve permitted without bending rails should be one degree with square joints and two degrees with broken joints; when track is raised one inch, every tie should be tamped outside and inside with tamping bars if the ballast is coarse; with sandy ballast, shovel tamping should be done inside; it is not economy to turn old ties. This Committee also recommends relaying gangs of 15 men and a foreman; that iron slimes should be used in laying rails to provide for expansion; that spikes should be driven on the same edge of the tie inside of the rail and on the opposite edge outside.

The evening session of the first day was devoted to a paper by Mr. P. H. Dudley on Steel Rails, Their Manufacture and Service. This was illustrated with samples, models of rails and of ingots, photographs, etc., and there was a large attendance, various officers of the railroads entering Boston being present besides the Roadmasters themselves. An abstract of Mr. Dudley's paper follows.

DUDLEY ON RAILS.

The diagrams taken by my car of your tracks years ago were supposed by many to indicate only a very general condition of the track, principally referring to the care of it. The diagrams being taken by a positive basis of measurement, and further being summed up mechanically, their study and analysis indicated very clearly the "condition of the steel" and enabled me to approximately point out how much improvement could be expected by labor, and if more was desired it must come from material. This was the first important result of many years of toil on my part.

The constant repetition from year to year of the "condition of track" per mile on the condensed diagrams clearly indicated whether the rails were smooth or wavy or irregularly worn, with small or large deflections, and you were no longer expected to make a track of imperfect rails equally as good as that from the best rails. Your work was more thoroughly appreciated, to which you quickly responded; and aided by the marking of the deflections under my car, improvements in surfacing were soon followed by a reduction of some of the long bends in the rails. The condensed diagrams were yearly reducing to the "condition of the steel" per mile, and for the past few years some of your tracks have been as smooth and stable as the rails and their condition permitted. With smooth rails your tracks attained a definite standard, rising higher as their stiffness increased. If the rails were rough from poor finish in the mills or irregular wear in service, it was reflected on the condensed diagram, while with more recent specially made smooth stiff rails your tracks have now reached a standard not considered possible a few years ago.

A steel rail to-day which will carry the wheel pressure both as a girder and without undue flow and abrasion is one of the important matters which railroad men must consider. [Here follows a definition of steel and a valuable but elementary discussion of the metallurgy of steel. It is excellent, but we cannot give the space to reproduce it.—EDITOR.]

. . . The deep-headed sections did not wear as formerly in the light sections. When the structure of these sections was examined it was found to be quite different, the early rails being fine, and in the latter rails coarse. In common with many others I proposed to increase the carbon in the rails and start with a higher grade of metal in the ingots to obtain in the finished rail a finer structure with the much less mechanical work of modern processes of rolling. Each different weight of section requires a slight difference of composition. I give in tabular form the chemical composition I use for my sections adopted from the Boston & Albany composition, which will be described later.

Weights per yard....	60, 65 and 70 lbs.	75 and 80 lbs.	100 lbs.
Carbon..............	.45 to .55	.50 to .60	.65 to .75
Manganese..........	.80 to 1.00	.80 to 1.00	.80 to 1.00
Silicon..............	.10 to .15	.10 to .15	0.10 to .15
Phosphorus } not to	.06	.06	.06
Sulphur.... } exceed	.07	.07	.07

In the specifications there is now inserted the following clause, which gives us an opportunity to meet conditions which may occur from day to day in making the rails:

"From the results of the inspections of the rolling of the ingots, blooms and rails, and from the drop tests, the inspector for the railroad company in charge of making the rails shall have the right to select the minimum or maximum limit of either the carbon, silicon or manganese or the three as the general guide for the composition, as he may consider the finished product requires to produce a tough rail with as dense fine grain heads as possible by the plant of the manufacturer."

The percentages of carbon, manganese and silicon are specified within certain limits, while the sulphur and phosphorus must not exceed certain limits. Carbon by itself up to or over one per cent. increases the hardness and tensile strength of the iron rapidly and at the same time decreases the elongation. The amount of carbon in the early rails ranged from .25 to .50 of one per cent., while in recent rails and very heavy sections it has been increased to .50, .60 and .75 of one per cent. With good irons and suitable sections it can run from .55 to .75 of one per cent. according to the section, and obtain fine grain tough rails with low phosphorus.

Manganese is a necessary ingredient in the first place to take up the oxide of iron formed in the bath of molten metal during the blow. It also is of great assistance to check red shortness of the ingots during the first passes in the blooming train. In the early rails .40 to .50 of one per cent. was sufficient when the ingots were hammered or the reductions in the passes in the trains were very much lighter than to-day. With the more rapid rolling of recent years, the manganese was very often increased to 1.25 to 1.50 per cent. It makes the rails hard with a coarse crystallization and with a decided tendency to brittleness. Rails high in manganese seem to flow quite easily especially under severe service or the use of sand, and oxidize rapidly in tunnels. From .80 to 1.00 per cent. seems to be all that is necessary for good rolling at the present time.

Silicon makes the steel lie very quiet in the molds, producing very solid ingots when present in .10 to .25 of one per cent. It tends to make the crystallization small —and in this way contributes to good wear. Some mills have not been able to increase the silicon over .10 of one per cent. without making the steel brittle, while others can run as high as .30 of one per cent., and the rails increase in toughness.

Sulphur and phosphorus are two impurities which are very objectionable. Sulphur makes the steel red short, liable to crack in rolling and checking the welding of the blowholes and pipes. The limit of sulphur is now specified from .07 to .12 of one per cent., the difference between the lower and upper limit will increase the number of seamy heads in the rails, oftentimes in my experience doubling the percentage of seconds on account of the seamy heads. Rails with .50 to .55 of carbon, .07 in phosphorus and .12 in sulphur do not seem to be brittle under the drop test, but very tough, as a rule when rolled in my sections. I am unable to speak for other sections. Most manufacturers do not consider that sulphur hurts the consumer as much as the manufacturers. A seamy head in a rail is not to be desired though the seams may not be over $\frac{1}{32}$ to $\frac{1}{16}$ of an inch in depth. Flow of metal can occur from a seam under the wheel pressures much easier than from a solid head. Phosphorus icreases the size of the crystallization, and makes the metal brittle and liable to break in cold weather. The percentage now allowed in rails ranges from .06 to .11 of one per cent.

. . . The many years of experience with steel rails have clearly demonstrated that those which flow the least under the wheel pressure give the most service, and those that flow the most wear and abrade with the greatest rapidity. This same remark applies to the flange abrasion on curves. As I have already stated, the most serviceable rails had a fine structure and small mineral aggregates. The less serviceable have a coarse structure and large mineral aggregates, though in many cases the so-called chemical composition was identical.

. . . As it is now well known, it is over 10 years since I made a broad, thin head for rails of heavy sections. . . . In the past nine years the N. Y. C. & H. R. R. R. Co. put 80,000 tons of my first 80-lb. section into trunk line service, and, notwithstanding over 50 per cent. increase in the wheel pressure, the rate of wear of these rails has been very small. Many railroads, seeing its good wearing qualities, have copied the thin head, so it is now a prominent type. . . . In 1890 I introduced a series of rail sections of different weights, especially designed to produce a tough fine structure in the heads by the modern process of rolling; also a special 95-lb. rail for the Boston & Albany. It was long ago observed that as the weight of the section increased the difficulties of producing a fine structure in the head were also increased. In order to secure a fine structure in my large sections, especially the Boston & Albany 95 lb., I proposed the following composition:

Carbon..............................	.60
Manganese..........................	.80 to .90
Silicon..............................	.10 to .15
Phosphorus not to exceed	.06
Sulphur "	.07

While great doubt was expressed as to the possibility of securing toughness with so high carbon, we were able to control the condition of the metal in the final product of the rails, so that they were of unexpected toughness. The butts stand a drop test of 2,000 lbs., falling 20 ft., and rarely broke, while hundreds stood 2 to 4 blows of 30 ft. before failing, supports 4 ft. apart. . . . I have no hesitancy in saying that it is the most important work yet undertaken to improve the quality of steel rails for present service. The contract for the first 16,000 tons of the 95-lb. rails was let to the Bethlehem Iron Company. Every effort was made by them to make the rails tough, and in this respect they were as agreeably surprised and gratified as any one. Dr. Webb, President of the Mohawk & Malone Railway, had 2,000 tons made upon the same formulas as the Boston & Albany 95 lbs., and 21,000 tons in .50 to .55 carbon.

Early in 1892, the N. Y. C. & H. R. R. adopted the high carbon formula for their rails, both for the 80-lb. and the new 65, 70, 75, 80 and 100-lb. sections they adopted from my series.

The Central Vermont 75-lb. and the Buffalo, Rochester & Pittsburgh 80-lb. sections are made about on the composition given in the tabular statement. To date, over 150,000 tons of these high carbon rails, in my series of sections of 60, 65, 70, 75, 80 and 100 lbs. have been rolled, about $\frac{9}{10}$ of the product being in the weights above 70 lbs.

. . . The top rail is liable to be more brittle than the other rails in the ingot. I have the top rail of the ingots marked A, the second B, the third C and fourth D. In a number of rails of old sections broken in the track last winter their structures indicate they were the top rails. This is one of the reasons why we must keep the phosphorus low in the high-grade steels so it will not be too high in the top rail.

The ingots were charged into horizontal heating furnaces at Bethlehem. There oil gas is used for heating, and at Scranton small coal is used.

The object of the heating furnaces is to equalize the heat between the interior and the exterior of the ingot. The entire ingot wants to be brought to a soft mellow heat, but should not be overheated, as the crystallization is then so strongly developed as to render it difficult to break it up in the subsequent rolling. The steel may also be burnt, in which case it rolls badly, is brittle and should be rejected.

Eleven passes were required in the rail rolls, and less than one minute after the bloom entered the first pass it came out of the last pass a finished rail. The high .60 carbon rails are very hard on the blooming and rail trains, frequently breaking the blooming and roughing rolls, and rapidly wearing the finishing rolls. The repairs are more than doubled over .45 to .50 carbon rails.

. . . The rails of my section only require from 6 in. to 7 in. camber, while the deep-headed rails, like the Boston 72-lb. rails, require 12 in. to 13 in. This is a very important factor in making tough and smooth rails.

As the rails were being rolled, a rail butt was sawed from each heat for the drop test, the heat number being stamped upon it. Before testing, each butt is stamped on the base or the head, as desired, with a stamp having seven prick points, making 6-in. divisions on the rail. When the butt is placed on the supports, and the drop of 2,000 lbs. falls upon it, we see how much elongation per inch it gives, and thus judge of the condition of the metal. In case the rail breaks, the elongation can still be measured, and if it does not reach the prescribed limits, then the rails of that heat are rejected. The drop test is the most valuable of any yet proposed to test the toughness of the rails. Spacing the butt for 6 in. before testing makes out of the drop a testing machine unequaled in efficiency and rapidity for rail sections. The information is valuable at once, and serves as a guide in the daily manufacture of the rails, checking the stock mixture, the blowing, re-carbonization, heating and temperature of rolling.

[Mr. Dudley gave also an outline of the reasons for the form of his sections.—EDITOR.]

The first subject taken up at the second day's session was the report of the Committee on the Comparative Merits of Spring Rail and Stiff Frogs. The points enumerated as of advantage in the spring rail frog are: durability, smoothness under the wheel, better surface. The points in favor of the stiff frog are: a broken wing rail can be more safely secured; there is better resistence to the action of deeply worn tires. The committee submitted a number of questions as to cost of maintenance, trouble from snow and ice, relative life of timbers, relative cost of repairs to rolling stock. What increase of traffic would warrant the use of spring rail frogs? Is it desirable to use the spring rail at a junction of a branch on the main line where both are used for passenger tracks, but many express trains on the main line? Which should be used when the frog is on the outside curve of main line? Is a spring rail frog more advantageous for trailing or facing point switch? Considering all things, what is the relative safety of the two frogs?

Mr. Sargent, of the Old Colony, would use spring rail frogs only in sidings. Mr. Stevens (Boston & Maine) was opposed to them entirely; he had had a great deal of trouble with them from snow and from spreading,

and his company had abandoned them. Mr. Bishop, of the Fitchburg, would recommend the stiff frog at junction points and in yards where there is a good deal of switching, but on his main line track he had found the spring rail frog much more durable. Mr. Drew, of the Old Colony, had used a good many spring rail frogs and had no trouble with them, and never had had one wear out. He uses braces on most of his wing rails. Mr. Bryant, of the Old Colony, had had some trouble from broken frogs and derailments with light rails, but with heavy rails he thought they were satisfactory; but for absolute safety he preferred the stiff frog. Mr. Drew concurred in this opinion as regards safety alone. Mr. French had had trouble from snow and ice in the use of the older forms of spring rail frog, but in the later styles there is no such trouble. Mr. Collins, of the Old Colony, would use nothing else but the spring rail frog. Mr. Patch would use the spring rail on main lines. In twenty-one years he had never had a wheel off the rail because of it. It requires a little more care in maintenance, and he uses salt once a day at his spring rail frogs in winter. He would not advise the use of it, however, at junction points.

The Convention finally passed a resolution to the effect that spring rail frogs should be used, but should be thoroughly made, used on rails of over 70 lbs. section and not at junction points and in yards where the travel is heavy both ways.

The next report taken up was that on the Care of Station Grounds. The recommendation of the committee was, that such grounds should be under the charge of a man especially appointed by the superintendent or roadmaster.

The next topic taken up was concerning the value of gravel pits, the economy of good ballast, and economical methods of loading and unloading ballast. Of course there could not be two opinions on the questions brought up in this report.

It was voted to hold the next annual Convention in Boston, on the third Wednesday in August, and after the usual resolutions of thanks, the Convention adjourned.

An invitation was received from the Thomas Electric Welding Co. to visit their rail welding machine in operation upon the tracks of the West End Street Railroad, Shawmut avenue, Boston. (Illustrated in the *Railroad Gazette*, July 14.)

The following is a list of the exhibits:

EXHIBITS.

Weber Railway Joint Manufacturing Co., New York, full size joint and blueprints.

Pennsylvania Steel Co., frog, switch and signal dept., Steelton, Pa., rail braces and blueprints of their spring rail frogs.

American Railway Equipment Co., New York, samples of the Servis brace head spike, Servis improved tie guard and the Servis Perfect nut-lock.

Ramapo Iron Works, Hillburn, N. Y., model of spring rail frog and photographs of the Ross, Ross-Meehan, Meehan-Snepard brake shoes; also model of switch stand.

Continuous Rail Joint Co. of America, Newark, N. J., full size joint.

Page Woven Wire Fence Co., Adrian, Mich., models of full-sized section of woven wire fence and samples of wire.

The National Surface Guard Co., Chicago, Ill., samples and photographs of the National Steel Surface cattle guard.

William Goldie, Jr., & Co., Pittsburgh, Pa., samples of Goldie's Perfect tie plate.

Dilworth, Porter & Co., Litd., Pittsburgh, Pa., the Goldie spike and Goldie tie plate for rail brace.

Positive Lock Washer Co., Newark, N. J., samples of the Positive lock washer.

Diamond State Iron Co., Wilmington, Del., samples of the Churchill rail joint and Crescent spike.

Ruffner & Son, Schuylkill Falls, Pa., samples of the Excelsior nut lock.

The Standard combination tie plate and brace, Philadelphia, Pa., full sized samples.

Breuil-Phillips Co., Philadelphia, model of the Phillips rail bender.

The National Lock Washer Co., Newark, N. J., samples.

Young Nut Lock Co., New York, samples

Harrington, Robinson & Co., Boston, New England agents of the Wharton Railroad Switch Co., Philadelphia, full sized Wharton switch.

Q. & C. Co., Chicago, Ill., models of the Servis tie plate, Q. & C. cattle guard, Q. & C. car replacer and photographs of the Bryant saw.

Fairbanks, Morse & Co., Chicago, Ill., model of the Sheffield velocipede hand car with dust guard attachment, full sized samples of the Barrett track jack, model of the Sheffield automatic standpipe and photograph of the group of four tanks recently erected by this firm at the Depew shops of the New York Central, the combined capacity of the four tanks being 200,000 gallons. They also exhibited samples of the cut gears for the Sheffield hand cars.

Standard Nut Lock Co., Newark, N. J., samples.

H. Gore & Co., Boston, full-sized models of the J. D. Reed rail joint and stringer system.

The Smith Friction Drill and Tool Co., Boston, drills of various sizes, also full size Perfected friction track drill, in working order, drilling a rail section.

Roberts, Throp & Co., Three Rivers, Mich., Roberts improved hand car, with detachable walking-beam frame, making it a combination hand and push car.

American Association for the Advancement of Science—Madison Meeting.

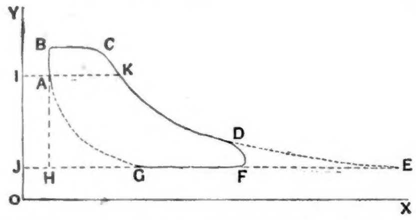
The annual meeting of the American Association for the Advancement of Science was held at Madison, Wis., Aug. 17-22, Prof. William Harkness, of Washington, presiding. The annual address by the retiring President, Prof. Joseph Le Conde, of California, on the subject of the origin of mountain ranges, was a valuable contribution to this subject by a specialist.

The only public lecture this year was by Dr. Daniel G. Brinton, on the "earliest man."

Dr. Brinton was elected President for next year and the following other officers were chosen: Vice-President—Section of Mathematics and Astronomy, George C. Comstock; Physics, William A. Rogers; Chemistry, T. H. Norton; Mechanical Science and Engineering, Mansfield Merriman; Geology and Geography, Samuel Calvin; Zoology, Samuel H. Scudder; Botany, L. W. Underwood; Anthropology, Franz Boas; Economic Science and Statistics, Henry Farquhar; Permanent Secretary, F. W. Putnam; General Secretary, H. L. Fairchild; Secretary of Council, James L. Howe.

The number of papers as well as the attendance of members was smaller than usual, and among the papers only a small proportion were of special interest to the *Railroad Gazette*. The annual address of S. W. Robinson, President of Section D, was on the subject of training in mechanical science.

Section D, Mechanical Engineering.—Eight papers were presented in this section. One of these was that by Prof. J. Burkitt Webb, of the Stevens Institute of Technology, on the Most Economical Amount of Compression in a Steam Engine.



The solution given by Professor Webb is to lay off the horizontal line $I\,K$ (fig. 1) at such a height that the area $A\,B\,C\,K$ is equal to the area $D\,E\,F$. The point A will then be the proper point to which the steam should be compressed. This method assumes isothermal expansion and compression. The card may be of any shape, provided the points A and G, where the compression curve joins the rest of the card, lie on the vertical $B\,H$ and horizontal $G\,F$, respectively. This will always be the case in a theoretical card, and may be made so in a practical card with sufficient accuracy. This method leads to the same result as that given by Cotterell, which is unnecessarily abstruse and not as general.

Prof. S. W. Robinson described a new form of transmission dynamometer, in which the reading is affected by the friction of only one of the bearings, and the correction for the same is thereby greatly reduced below that of many other forms. Prof. D. S. Jacobus presented three papers: First. The experimental determination of the quickness of action of a shaft governor. In this, the charts taken automatically from the governor were exhibited. Second. An accurate method of measuring heavy pressures where means of measuring pressures of 25,000 lbs. per square inch were described. Third. Tests of automatic fire sprinklers, in which the methods now in use at the Stevens Institute were explained in detail.

The test of the plant of the Hygeia Ice Company, of New York, by Messrs. Hupfel, Griswold and Kennedy, gave the results in detail of the steam used for each separate process.

Prof. William A. Rogers presented a paper in which he stated that after 13 years of careful experimenting he had found no changes in the dimensions of metal employed in his standards of length, which may be due to changes in their molecular structure, depending on their age.

An Easy Method of Determining Shear Stresses.

The following simple method of computing the shearing stresses in a bridge or truss is presented with the belief that it will prove interesting and of some practical use to our readers. It is very useful to check graphical calculations, and commends itself to practical men, because it is so easily understood. It will find favor with car builders, bridge builders and carpenters for that reason.

The method is said to have been first employed by Whipple, and is, therefore, an old one. The older bridge engineers are doubtless familiar with it, but to the younger men of the engineering profession and to those who have not had the advantages of a technical training or the assistance *of* and experience *with* practical men it will be new, and it is thought a relief in many cases from the graphical or other analytic ways.

To explain the method—take the accompanying diagram (fig. 1) of a bridge truss, and let the weight of the bridge be 15 tons, then the weight of one panel will be one-fifth of 15 tons, which is three tons, represented by the small circle (w) suspended at I, J, K, L, fig. 1, and call it the dead load per panel; let the live or moving load per panel be represented by the large circles (W). Now from the principle of the lever the abutment B must carry $\frac{1}{5}$ of the loads at I and the abutment A must carry $\frac{4}{5}$ of the same load at I. Therefore the $\frac{1}{5}$ of the loads at I must be carried through the panels $I\,F$, $J\,G$, $K\,H$ and $L\,D$ to the abutment B. On the same principle $\frac{2}{5}$ of the load at J must traverse panels $J\,G$, $K\,H$ and $L\,D$ and $\frac{3}{5}$ of the load at K the panels $K\,H$ and $L\,D$, and $\frac{4}{5}$ of the load at L will traverse $L\,D$, then the total load traversing panel KH from left to right toward B is the $\frac{1}{5}$ of I load + $\frac{2}{5}$ of J load + $\frac{3}{5}$ of K load. In the same manner it may be shown what amount of the loads are carried through the panels to the abutment A; and through the panel $K\,H$ or $L\,G$ one-fifth of the load at L is carried. If the loads are all alike at I, J, K and L, we have then a vertical pull at K on left end of panel $K\,L$ equal to $\frac{1}{5}$ of I load + $\frac{2}{5}$ of J + $\frac{3}{5}$ of K, or $\frac{6}{5}$ of one panel load; and on the other (right) side of this panel $K\,L$ at L there is a pull down of one-fifth of a panel load. Now, if there were no rods or lines $K\,H$ or $G\,L$ across the panel and the members were hinged at G, H, K and L, the panel would collapse or assume an oblique shape. This would not occur if the pull down at K were the same as at L, but if the pull is greater at K than it is at L, then a tierod or strut must be put in to keep the corner K from pulling away from H, and the vertical component of the stress in this rod $K\,H$ will be the difference in the downward pull at K and that at L, or the difference between six-fifths and one-fifth of a panel load.

If now the live load W, at L, be removed, then the vertical component of the stress in bar $K\,H$ will be $\frac{6}{5}$ of the total load of one panel less $\frac{1}{5}$ of the dead load at L. Likewise for the member $J\,G$ the maximum load will be when there are *live and dead* loads at I and J and only *dead* loads at K and L. Under such a loading the vertical component of stress in $J\,G$ will be $\frac{3}{5}$ of a total load per panel less $\frac{3}{5}$ of the dead load per panel.

Some problems will best illustrate the simplicity and rapidity with which the stresses in the vertical and diagonal members may be determined. Take first a simple Pratt truss of eight panels, fig. 2, and assume the aggregate dead and *live* load per panel as 10 tons and the *dead* load per panel as three tons. Number the panels of the truss from left to right, beginning with O and write the numbers above each panel of the truss, fig. 2.

It should be observed that the numbers over each panel show the number of eighths of a panel load that traverses the panel from left to right; the lower row above the truss being the amount due to the loading upon its left hand panel point alone and the upper row

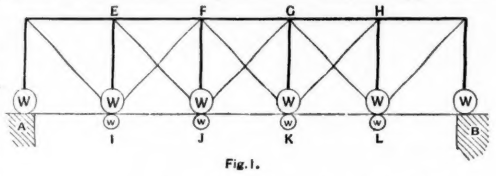


Fig. 1.

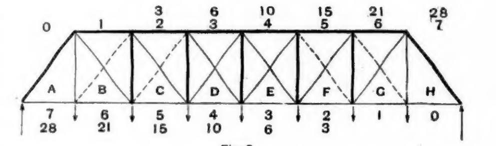


Fig. 2.

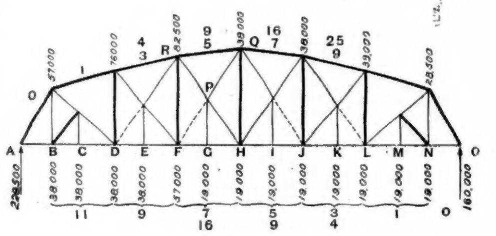


Fig. 3.

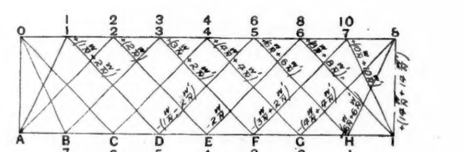


Fig. 4.

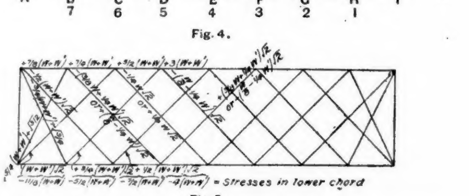


Fig. 5.

being the sum of all the loadings to the left of that panel. For if the $\frac{1}{8}$ panel load that traverses panel B be added to the $\frac{2}{8}$-panel loads that traverses C it will give a total traversing panel C from left to right of 3, which is written above panel C in the second row of figures above. Now in panel D we have these three panel loads added to the three from the adjacent panel joint making 6, and for the next panel E 6 + 4 are 10, etc., which gives the second row of figures as 1, 3, 6, 10, 15, 21, 28. These numbers are for the combined live and dead loads. Underneath the bridge write from right to left two similar rows of figures representing the panel loads it carried from the right to the left abutment A. Now, it is evident that there will be the greatest shear in any panel when the bridge is loaded up to that panel and is unloaded for the rest of the bridge length. For there then will be the greatest difference of weight at the two lower corners of the panel. The greatest vertical weight then, that the diagonal member of panel F will have to sustain will be $\frac{15}{8}$ of 10 tons (the total load per panel) less the three-eighths of three tons (the dead load per panel), which is 17.63 tons. And the stress in the direction of the rod will be the oblique component of 17.63 tons. The *vertical* stress in panel E will be $\frac{\ }{8}$ of 10 tons less $\frac{6}{8}$ of three tons = $10\frac{1}{4}$ tons, which the oblique rod through E must sustain, and so on for the other panels.

The method can be applied to other types of trusses as well. Bridges with oblique chords, such as bow-string

trusses, may be handled in the same manner and with irregular loading. A reference to a truss with oblique upper chord and sub-panels, fig. 3, will show how such a truss may be treated. If the greatest shear in panel *F—G* is required it should be considered as loaded with a train headed by an engine, to panel point between *F* and *G*, a little past the middle. The loads are written below the truss, fig. 3, and are those adopted for the Sixty-third street bridge of Chicago South Side Rapid Transit Elevated Railroad. It is a truss of 230 ft. span.

In this truss there are six full panels and two half panels at the end, or fourteen half panels in all, but of the panel points that are liable to displacement there are seven, viz., numbers *B, D, F, H, J, L* and *N*. The other intermediate points of support, *C, E, G, I, K* and *M* are merely suspended from the struts resting on these panel points. Therefore, adding one-half of the loads at these intermediate points to each of the primary panel points the loading becomes, as is indicated in fig. 3, above the truss.

By the same process of reasoning as has been explained, the shear in panel *F—G* will be the difference between the vertical weights carried through that panel to abutment *O*, less the vertical weights carried through the panel to abutment *A*. This is determined in the same manner as in the other cases. Of the load at *B* $\frac{1}{14}$ goes to *O*, of that at *D* $\frac{3}{14}$, and of that at *F* $\frac{5}{14}$, which together make 50,893 lbs. And of the loads at *N*, *L*, *J* and *H* that pass through panel *F—G* to the abutment *A* there are $\frac{1}{14}$ of 28,500, and $\frac{3}{14} + \frac{5}{14} + \frac{7}{14}$ of 38,000, which makes 42,750. The difference between 50,893 and 42,750 is 8,143 lbs., which weight must be sustained by the diagonal tie rod *F P* and the chord-post *R Q*, and which may be resolved into the directions of these two members. The shearing stresses in other panels can be determined after the same manner with equal rapidity.

The method is specially applicable to the double intersection Pratt truss, which by other methods is to a slight degree a matter of conjecture and doubt.

It is handled by treating the intersecting trusses as two simple Pratt trusses and by following the total loads through the members from left to right to the abutment, and then following the dead loads from right to left adding or subtracting the vertical components of dead loads of each member as they are in the same or opposite directions to those of the total loads. The results are indicated in fig. 4 and fig. 5, fig. 4 giving the vertical component of each member and fig. 5 the component in the direction of the piece, for a truss whose diagonals are 45 deg. to the chords. It is believed that the results will be easily verified without further explanation, after what has preceded with reference to other forms of bridges. In figs. 4 and 5, *W* represents the moving or rolling load, and *w'* the dead load.

TECHNICAL.

Manufacturing and Business.

The directors of the Barney & Smith Car Company, of Dayton, O., have declared a regular quarterly dividend of two per cent. on the preferred stock of the company, payable Sept. 1, 1893.

The Westinghouse Air Brake Works, at Wilmerding, Pa., will run only four days at eight hours a day until further notice, instead of six days at nine hours, as at present.

George H. Bryant, formerly with the Q. & C. Co., has opened an office at 468 Rookery, Chicago. He will deal in railroad supplies, and among other specialties will handle the Young lock nut.

The Detroit Foundry Equipment Co. has opened an eastern office at 182 Front street, New York, in charge of Mr. J. Gilmour.

The Interchangeable Tool Co. has obtained a site at Utica, N. Y., upon which to erect a factory 200 ft. long and 50 ft. wide. It will be ready to start up by Jan. 1.

The Michigan-Peninsular Car Co. has in the last few weeks discharged nearly 1,500 of its employees and made large reductions in the wages of those remaining at work. It is announced that the car-building plant will be closed about Sept. 1, when the present orders are finished. The directors have voted to lay off all office employees for three months without pay, and all superintendents and chiefs of departments for the same period on half pay.

The Berlin Iron Bridge Co., of East Berlin, Conn., is full of orders, and is running its entire plant full time and portions overtime. It has contracts for a large amount of work including a new electric light and power station at Lynn, Mass.; a drawbridge at Salem, Mass.; a new foundry building for the New Home Sewing Machine Co., at Orange, Mass.; an iron building to go to Tampa, Fla.; a large bridge for Chester County, Penn.; a new iron storehouse for the New York Knife Co., at Walden, N. Y.; a large power plant for the Philadelphia Traction Co.; a large cotton shed for the Southern Pacific Railroad, at New Orleans; a new roof for the purifier-house of the Northern Liberties Gas Co., at Philadelphia; a new power-house for the Reading Traction Co., of Reading, and the State Street Railroad, at New Haven, Conn.; a car barn for the Easton Transit Co., at Easton, Pa.; a large smelter building for the Anaconda Smelting Co., at Anaconda, Mont. Besides these the company has numerous small jobs scattered throughout the country which will employ its entire plant until after Jan. 1, next.

New Stations and Shops.

The United Counties Railroad is about to erect a new station at St. Hyacinthe, Que.

The New York, Philadelphia & Norfolk is preparing to build a $7,000 passenger station at Salisbury, Md.

A site has been selected on Tierney street, Arnprior, Ont., for the proposed station for the Ottawa & Parry Sound Railroad.

The Pennsylvania Railroad has begun the erection of a shop at Washington, D. C., which will be 170×161 ft. in size, constructed of corrugated iron, and will admit of 32 cars being repaired at one time.

The Brooklyn elevated railroad company is changing its stations on Myrtle avenue at Washington and Vanderbilt avenues, and making them double or intertrack stations instead of maintaining two separate stations, one for uptown and the other for downtown trains as heretofore. A new station is also being built at Cumberland street and Myrtle avenue.

Iron and Steel.

Orders have been issued to shut down the Edgar Thomson Steel Works of the Carnegie Steel Company at Braddock, owing to lack of orders. Two thousand men will be thrown out of work.

Receivers Kemp and Keenan, of the Troy Steel & Iron Company, have been granted authority to resume work at the Albany Iron Works and on the merchant train at the Rensselaer Iron Works, to complete the orders on hand. These departments of the company's plants will start this week.

The Oliver Iron & Steel Co., one of the largest concerns of its kind in the country, went into the hands of H. W. Oliver, senior member of the firm, as Receiver, last week on the application before Judge Acheson, of the United States Circuit Court, by the National Tube Works Co. It was alleged that the indebtedness of the company was $700,000. Of this amount $400,000 is payable within 90 days. About $300,000 more is in collateral bills, payable by pledge of pig iron and stocks and bonds in coke and natural gas companies. The bonded indebtedness is $585,000. The company has extensive plants in Pittsburgh and Allegheny and employs about 4,000 men.

Car Lighting and Heating.

The Safety Car Heating & Lighting Company has a good exhibit at the World's Fair, and, although its devices are thoroughly well known to railroad men, the display of them there must be interesting to the traveling public—and who does not travel? The installation includes apparatus for car lighting and for car heating. The Pintsch lamps are shown attached to a car roof, and these are fed from a gas-holder, such as would ordinarily be placed in a railroad yard. The holder is connected by a pipe line to the compressing works of the company. In the exhibit of heating apparatus is shown the Safety system arranged for use with the Baker heater, which is said to be now in use on more than 2,000 cars. There is also an arrangement for direct steam heating, a special feature of which permits steam to be cut off from one or more of the pipes to prevent overheating.

High Carbon Rails.

The rolling has just been finished of 2,000 tons of rails of Dudley's 80 lb. section at Bethlehem, .60 carbon, for the Buffalo, Rochester & Pittsburgh. This will make about 11,000 tons they have had. The drilling is Col. Katte's standard of the N. Y. C. & H. R. R. R.; splice being the same section, but 42 in. long, to give more space for tamping the joint ties.

The "Campania."

It appears that we were premature in saying that the "Campania" has gone into dock for extensive changes. We were misled by a cable dispatch from London. From all we can learn, however, the announcement was merely premature.

An Early Beton Bridge.

Now that so much attention is given to the Monier and other systems of béton construction, it is interesting to note that one of the oldest, if not the oldest, bridge of this type is that spanning the small river which runs through the town of Erlisbach, in Switzerland. The bridge was built in the year 1840 by the Aaran (Switzerland) Cement Factory, and was presented to the municipality in question by the builders, personally, as a striking specimen of what could be accomplished with their product. The length of the bridge is 24 ft., and even at the present time the structure is in excellent condition. Tradition has it, according to the *Schweizerische Bauzeitung*, that large quantities of milk were used in mixing the cement for the work; but in some old documents relating to it, and recently unearthed, nothing is said of this. The story, no doubt, is on a par with that according to which the mortar used in some of the old Swiss mountain ruins was mixed with wine to give it unusual strength.

A Black Sea-Caspian Canal.

The project of building a canal to connect the Black and the Caspian seas, which has come up for discussion periodically during the past hundred years, has latterly again attracted attention. The far reaching importance of such a canal to Southern Russia has long been generally appreciated, establishing, as it would, direct communication with Persia, Central Asia and India, and affording also a cheap and easy means of transportation from the Russian petroleum and naphtha fields to the ocean. A study of the subject made last year by the Russian engineer, Danilow, is said to have led to the conclusion that the building of such a canal would present no remarkable engineering difficulties, Danilow's plan looking to the utilization, for part of the distance, of the river Manytsch as a natural waterway.

Service Test of the "Greater Britain."

The Webb compound locomotive "Greater Britain" was subjected last April to a careful service test of one week. This, it will be remembered, is a sister engine to the "Queen Empress," now on exhibition at the World's Fair. She has two high-pressure cylinders, 15-in. × 24-in., and one low pressure, 30-in. × 24-in. The drivers are 7 ft. 1 in. diameter, and there is a single pair of trailing wheels at each end, 4 ft. 1½ in. diameter. The boiler is 18 ft. 6 in. long and 4 ft. 3 in. diameter. There is an intermediate combustion chamber in the barrel, dividing the tubes into two lengths; there are 156 tubes 2⅛ in. outside diameter; between the firebox plate and the combustion chamber the tubes are 5 ft. 10 in. long, and from the combustion chamber to the smokebox plate they are 10 ft. 1 in. long. The total heating surface is.

Tubes	1,346 sq. ft.
Combustion chamber	39.1 sq. ft.
Firebox	120.6 sq. ft.
Total	1,505.7 sq. ft.

The grate area is 20.5 sq. ft.; the weight in working order is 52 tons 2 hundredweight, of which 31 tons is carried on the drivers. The boiler pressure is 175 lbs. per sq. in. The following gives the chief results of the running of this engine from April 17 to April 22, inclusive:

		Tons.	Cwt.
Average weight of train, including passengers, etc., but excluding engine and tender		160	8
Average weight of train, including passengers, etc., and engine and tender		237	10
Time table, deducting stops	76 h. 7 min.		
Deduct time made up by locomotive	0 h. 50 min.		
Actual running time		75 h. 17 min.	
Total distance traveled attached to trains	3,588 miles		
Total distance traveled light	24 "		
		3,612 miles	

$$\text{Average speed} \ldots \frac{3{,}588 \text{ miles}}{75 \text{ h. } 17 \text{ min.}} = 47.66 \text{ miles per hour}$$

Total weight of coal consumed, excluding lighting up	47 tons 17 cwt.	
Actual consumption of coal per mile, excluding lighting up		29.87 lbs.
Consumption of coal per mile, including 1.2 lbs. for lighting up		31.07 "
Ton-miles, including passengers, etc., but excluding engine and tender		575,557
Ton-miles, including passengers, etc., and engine and tender		852,224
Coal per mile per ton of train, including passengers, luggage and mails, but excluding engine and tender, at 29.87 lbs. per mile		2.979 ozs.
Consumption of coal per mile per ton of train, including passengers, luggage and mails, and including engine and tender, at 29.87 lbs. per mile		2.012 ozs.

THE SCRAP HEAP.

Notes

The express car of passenger train No. 4 of the St. Louis & San Francisco was robbed at St. James, Mo., on the morning of Aug. 17.

An injunction has been issued restraining the Railroad and Warehouse Commissioners of Minnesota from executing a contract for the proposed state grain elevator at Duluth.

Near Uniontown, Pa., on Aug. 15, a passenger in a train of the Baltimore & Ohio was shot and killed by a passenger who refused to pay his fare and resisted the conductor.

The Norfolk & Western has commenced work on a new yard at Vivian, W. Va., which will be second in size and convenience only to the yard at Bluefield, W. Va.

Mr. George A. Daly, a citizen of the United States, who, while employed on the Mexican Central as locomotive engineer, accidentally ran over and killed a man 14 months ago and was imprisoned, has been released by the Supreme Court. Daly was sentenced to imprisonment for two years. He appealed to the Circuit Court, where the sentence was confirmed and more added to it, but the Supreme Court decided in favor of his release.

At North Abington, Mass., on Aug. 16, the trackmen of the Old Colony road, who tore up certain tracks in defiance of an order of the town officers, resisted arrest when the police attempted to stop the work, and a lively fight ensued; shovels and picks were freely used and the town officers fought with a stream of water from fire hose. A number of men were injured and many plate glass windows broken. On the 23d Division Superintendent Sanborn, Roadmaster Bryant and Detective Bailey were sentenced to one month's imprisonment for their part in the affair.

According to press dispatches the Manitoba & Northwestern enjoys the distinction of having had, last week, the most complete railroad strike on record—all the employees, including station agents and telegraph operators, having left work on Tuesday because their pay was several months past due. The road, which is about 250 miles long, went into the hands of a Receiver las June and the court was slow in authorizing the Receiver to pay back wages. The strike had the desired effect, the court issuing an order on Thursday to pay the wages due. The General Manager was the only ma who remained on duty.

Judge Williams, of the United States Circuit Court decided against the St. Paul & Duluth in the matter of

stopping all passenger trains at county seats in Minnesota. The case was taken to the Federal Court on an appeal from the local court at Pine City, where an engineer was fined for running past the station without stopping, thus violating the state law. The attorneys for the defense made an elaborate argument, setting forth among other things that it was an interference with interstate commerce; that the train was a vehicle of the United States Government, inasmuch as it carries mail; also that it is not a reasonable police regulation. The judge decided all these points against the railroad, and in the matter of interference with interstate commerce held that the stopping of a train long enough to discharge and take on passengers was not such.

Some English Notions of the Situation.

The fact is that most American railway bonds are sound securities, and hardly any other of equal merit can be obtained, which will yield, say, on an average, about 4½ per cent. The majority of them are protected by a big margin of safety, even in those cases where dividends are not paid on the ordinary shares; for often bonds are strengthened rather than weakened by net revenue being withheld from the shareholders, and employed in "betterments." Moreover, they are protected by the knowledge of the directors that mortgage bonds, unlike shares, have definite rights which can be enforced, and that therefore it will not do to play fast and loose with those who have at their command the power of foreclosure. These considerations, and the extreme scarcity of really sound securities, have no doubt supported American railway bonds through the crisis which Wall street has recently experienced, and from which it has not emerged. The fall in many of the better class American railway shares is not warranted by the change that has taken place in the general conditions; but in some cases at least this cannot be asserted. . . .

The public will do well to remember that, although there may be much that is unsound in the financial management of American railway companies, the difficulties that are now being experienced, or which may be experienced, are not due to that cause, but result mainly from the conditions which have been set up in the United States by the collapse of a vicious system of protection and an unwise currency policy. And in both respects we may now expect to see an improvement, although before a change for the better takes place further difficulties may be experienced. From no point of view, however, does the present abnormally low level of prices in Wall street appear to be justified. The outlook, it is true, is far from encouraging, and we are told, of course, that the confidence of the public has been so far impaired that they are not likely to give any support to the market for years to come. But we have seen the outlook blacker before now. . . . For we have to remember that a psychological change may be just as effectual as a decided alteration in the actual conditions, speculative values, which is all that most American railway issues possess, being almost entirely dependent upon mere "fancy."—*The Economist (London.)*

Precautions Against Spread of Cholera.

The German Department of Public Works has issued a set of rules for German railroad and train officials to be observed during the cholera period. These rules provide for the treatment to be followed in cases of suspicious illness aboard trains, and the disinfection of cars and car equipments, and refer in a general way to the manner of preparing and using some of the different kinds of efficient cholera disinfectants.

CAR BUILDING.

The Pennsylvania is building 225 box cars at its Altoona shops for use on the Pennsylvania lines west of Pittsburgh.

BRIDGE BUILDING.

Baltimore, Md.—The Campbell-Zell Co. has completed the iron bridge over Jones' Falls at East Lexington street. It cost about $26,000, and is 80 ft. wide.

Buckhannon, W. Va.—The Hudkins bridge in this county has been condemned for the second time, and the County Commissioners have begun negotiations for replacing it with a steel structure.

Brunswick, Md.—Five spans and the Maryland approach to the bridge being erected across the Potomac at this point by the Youngstown Bridge Co., have been completed, leaving five spans and the Virginia approach to be built.

Catlettsburg, Ky.—Work on the Chesapeake & Ohio railroad bridge over the Big Sandy River at this point is progressing finely. Over 200,000 ft. of timbers for the cofferdams and falsework, etc., is on the ground ready for use. The stonework has been commenced and the superstructure will be ready as soon as the foundations are ready to receive it. A description of this bridge was printed in the *Railroad Gazette* of March 17, p. 215.

Chambly, Que.—The bridge across the Richelieu River, between this place and Richelieu, which was destroyed by fire a couple of years ago, will be rebuilt this fall by the Estate Yuile. It will be of steel and iron and will cost about $40,000.

Columbus, O.—Bids have been received by the County Commissioners for the proposed bridge over the Ohio Canal, south of the city, from the Wrought Iron Bridge Co., of Canton, O.; Jackson Bridge Co., Buchanan Bridge Co., Sawyier & Arthur, Pittsburgh Bridge Co., Detroit Bridge Co., Youngstown Bridge Co., Toledo Bridge Co., Massillon Bridge Co., Penn Bridge Co. and the Columbus Bridge Co. The bids range from $1,900 to $2,400.

The Wrought Iron Bridge Co. has been given a contract to build the superstructure of the bridge over Big Run at $685.

Columbia, Pa.—A new bridge is to be erected over the Conestoga Creek near Ronk's Mill.

Harrisburg, Pa.—The county will bear the cost of erecting new bridges over Powell's Creek in Halifax Township, and over Manada Creek in Lower Paxton Township.

Lancaster, Pa.—The Groton Bridge Company, of Groton, N. Y., will erect the iron superstructure of the bridge over the Octoraro Creek, on the road leading from Tayloria, in this county, to Glenroy, Chester county, at its bid of $995. The total cost of the bridge will be $1,574.

Newmarket, Ont.—The Town Council has decided to construct two steel bridges, one over Holland River on Queen street, and the other over the same river on Water street. Debentures will be issued to cover the cost of the work.

Piedmont, W. Va.—There may be some delay about building the new bridge between Piedmont, W. Va., and Luke, Md., recently described in the *Railroad Gazette*, on account of disagreements as to the location. Injunctions have been threatened, and although the contract has been advertised to be let next week, the award may be postponed.

Spokane, Wash.—Bids for the construction of a steel bridge across the river at Post street were opened by the board of public works last week. They were as follows. San Francisco Bridge Co., plan a, $15,795; b, $14,800; c, $15,200. Smith Bridge Co., plan a, $17,872; b, $15,785; c, $16,232; d, $15,430; e, $14,636; f, $14,000. Missouri Valley Bridge & Iron Works, St. Louis, plan a, $18,849; b, $19,949; c, $17,237. Bullen Bridge Co., Portland, $15,689. Pacific Bridge Co., Portland, a, $16,200; b, $14,540.

St. Roch de l'Achigan, Que.—Engineers Mignault and Belanger, Montreal, are preparing plans for an iron bridge to be constructed at this place; the bridge is to be 140 ft. long.

St. Cloud, Minn.—The council has asked for a bid to build a 24-ft. roadway bridge, combination iron and wood, across the Mississippi River, to re-place the present St. Germain street bridge. It is estimated to cost $15,000. As stated last week the proposition to build a new bridge to cost $50,000 was defeated at a town election.

Welch, W. Va.—W. R. Jaeger, J. A. Strather and L. L. Chambers, special commissioners, will receive bids until Sept. 10 for the construction of an iron bridge over Tug River at Jaeger, McDowell County, W. Va. The bridge is to be 14 ft. wide, with sidewalks; the main span, of 100 ft., supported upon cylindrical iron columns filled with broken stone and cement, resting upon solid masonry. The cost is estimated at $5,000.

Wheeling, W. Va.—The Board of County Commissioners of this (Ohio) county have authorized the Committee on Roads and Bridges to contract for the construction of a new bridge over Wheeling Creek, at Rooney's Point, W. Va. The bridge will be in two spans, and is to be built of steel.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Burlington & Quincy, quarterly, 1½ per cent., payable Sept. 15.

Florida Central & Peninsular, special, Jacksonville, Fla., Sept. 15.

Fort Wayne & Jackson, semi-annual, 2¾ per cent. on preferred stock, payable Sept. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 20.

Iowa Central, annual, New York City, Sept. 8.

Toledo & Ohio Central, annual, Toledo, O., Sept. 4.

Wabash, annual, St. Louis, Mo., Sept. 12.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its annual meeting at Chicago on Sept. 12, 13 and 14. The headquarters will be at the Southern Hotel, Twenty-second street and Wabash avenue. The meetings will be held at Metcalfe Hall, No. 137 Twenty-second street. The programme of this meeting was published Aug. 18, p. 628.

The *Master Car and Locomotive Painters' Association* will hold its next annual convention at Odd Fellows' Hall, Milwaukee, Wis., Sept. 13, 14 and 15. The headquarters of the Association will be at the Kirby House, corner of Mason and Water streets. The programme of this meeting was published in our issue of July 28, p. 575.

The American Association of General Passenger and Ticket Agents will hold a semi-annual meeting at the Plankinton Hotel, Milwaukee, Wis., on Sept. 19.

The Western Railway Club meets in room 730, The Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m. The meetings have been adjourned to Sep. 19.

The New York Railroad Club meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The Northwest Railroad Club meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The American Society of Civil Engineers meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

American Association of General Passenger and Ticket Agents

The thirty-eighth semi-annual meeting of this Association will be held at the Plankinton Hotel, Milwaukee, Wis., at 11 o'clock a. m., Tuesday, Sept. 19, 1893. A. J. Smith, General Passenger and Ticket Agent Lake Shore & Michigan Southern R. R., is Secretary of the Association.

The Pennsylvania Street Railway Association.

The annual convention of the Pennsylvania Street Railway Association will be held at Harrisburg, Pa., on Wednesday, Sept. 6, 1893, at 11 o'clock in the morning. This is the second meeting of the Association, which was organized a year ago, and the Executive Committee urges all the street railroad companies of the state to send representative delegates to the convention. The hotel headquarters will be at the Commonwealth Hotel. L. B. Reifsneider, of Altoona, is Secretary of the Association.

Iron and Steel Institute.

The autumn meeting of the Iron and Steel Institute (British) will be held at Darlington, Sept. 26, 27 and 28. The programme will embrace visits to various works in the district. The following is a list of the papers to be read: On the Manufacture of Basic Steel at Witkowitz. By Paul Kupelwieser. On the Consett Ironworks. By W. Jenkins (Vice-President). On the Works of the Weardale Coal and Iron Company. By H. W. Hollis. On the Metallurgical Exhibits at the Chicago World's Fair. By H. Bauerman, Assoc. M. Inst. C. E., F. G. S. On Wire Manufacture. By J. P. Bedson. On the Sampling of Iron Ore. By Thomas Clarkson, Assoc. M. Inst. C. E. On Carbon in Iron. By Professor Ledebur, Freiberg. On the Influence of the Rating of the Rupee on the World's Iron Trade. By Prof. W.C. Roberts-Austen, C. B., F. R. S.

PERSONAL.

—A monument erected in honor of Louis Favre, the projector of the great St. Gothard Tunnel, was unveiled at Chene-Bourg, near Geneva, Switzerland, on July 30, with appropriate ceremonies.

—Mr. William Garstang, Superintendent of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis, who has been in England for several months and was reported to be very ill there, returned to this country last week much improved in health.

—Maj Hamilton Wilkins, has been appointed Roadmaster of the Port Royal & Western Carolina road. He was formerly Roadmaster of the Augusta, Gibson & Summerville, and later was Superintendent and Receiver of that road.

—Mr. F. P. Read has been recently appointed Chief Engineer of the St. Louis, Chicago & St. Paul road, in place of Mr. E. M. Rice, resigned, with office at Springfield, Ill. He will have charge of the construction of the branches, now partly completed.

—Mr. W. H. Mealy has been appointed Superintendent on the Mexican Central Railroad, with headquarters in Tampico, Mex. Mr. Mealy was formerly Superintendent of the middle division of the Mexican National Railroad, with headquarters at San Luis Potosi.

—Mr. W. C. Whitney resigned as Director of the Boston & Maine this week, and Vice-President Lucius Tuttle, of the New York, New Haven & Hartford Railroad, was chosen to succeed him. Immediately thereafter Mr. Tuttle was elected President of the Boston & Maine.

—Mr. C. H. Fitzgerald, Western Passenger Agent of the Louisville & Nashville, with office at Kansas City, Mo., and Mr. W. W. Penn, Traveling Passenger Agent, with office at Junction City, Ky., have resigned, and these offices, with others in the Traffic Department, will be abolished on Sept. 1.

—Mr. William Findlay Shunk has been appointed Engineer to the Pennsylvania State Forestry Commission. The reader will remember, doubtless, that Mr. Shunk's latest work has been as chief of one of the field parties making the surveys for the Intercontinental Railroad. He has but lately returned from that work.

—Mr. William J. Rotch, a director of the Old Colony Railroad and of the Cleveland, Canton & Southern Railroad, and a resident of New Bedford, Mass., died in that town on Aug. 16, aged 74 years. He was at one time Mayor of the town and was a large stockholder and director in many of its large manufacturing industries.

—The reported appointment of Mr. A. G. Wells, formerly Division Superintendent of the Cleveland, Cincinnati, Chicago & St. Louis, as Superintendent of the Atlantic & Pacific is erroneous. Mr. Wells is now in the service of the Atlantic & Pacific, but has not been appointed Division Superintendent.

—Mr. A. W. Anderson, General Agent of the Port Royal & Western Carolina road at Greenville, S. C., is now Superintendent of that railroad. It is now operated independently of the Central of Georgia, and Mr. W. A. Moore, the former Superintendent, has been transferred to another division of the Central of Georgia.

—Mr. E. C. Ericson, who was appointed Engineer of Maintenance of Way on the Pittsburgh, Ft. Wayne & Chicago in July, has removed his headquarters to Fort Wayne and assumed his new duties. He formerly held a similar position with the Cincinnati & Muskingum Valley road, one of the controlled lines of the Pennsylvania, with headquarters at Zanesville, O.

—Mr. William A. Nettleton, Superintendent of Terminals of the Kansas City, Fort Scott & Memphis, has been appointed Assistant Superintendent of Motive Power and Machinery of the same railroad and Mr. D. C. Perry becomes his successor as Superintendent of the Memphis Terminals. Mr. Nettleton is a son of President George H. Nettleton, of the same company.

—Mr. W. L. Huse, of St. Louis, was elected President of the Tennessee Midland and Paducah, Tennessee & Alabama railroads, which are operated under one management, at a meeting of the directors of the two companies held in St. Louis last week. He succeeds the late T. J. Moss, of St. Louis, who had been President of the Paducah, Tennessee & Alabama since its organization.

—The office of Mr. H. A. Johnson, Division Freight and Passenger Agent of the Pacific Coast Division of the Great Northern, was abolished last week. Mr. Johnson was formerly Traveling Freight Agent in the State of Washington, and was appointed Division Freight Agent in February, 1893. He was formerly Assistant General Freight Agent of the Union Pacific in 1890, and then General Freight Agent of the Gulf Division.

—Mr. P. Sheedy, Master Mechanic of the Salt Lake Division of the Southern Pacific, has been transferred to the motive power and machinery department of the Coast Division, including both car and locomotive departments, with headquarters at San Francisco. Mr. H. L. Stevenson, Road Foreman of Engines, has assumed charge of the motive power and machinery department of the Salt Lake Division, with the title of Acting Master Mechanic.

—Mr. Alexander Mitchell, who has been Superintendent of Motive Power and Rolling Stock of the Eastern and Northern divisions of the Philadelphia & Reading, (the Lehigh Valley lines), has been appointed to the same position on the entire Lehigh Valley system. Mr. Mitchell's appointment as Assistant Superintendent of Motive Power was made after the lease to the Philadelphia & Reading. He was previously Superintendent of the Wyoming Division.

—Mr. James K. O. Sherwood was appointed on last Saturday Receiver of the Philadelphia, Reading & New England Railroad Co., owners of the Poughkeepsie

Bridge Co., and the Central New England & Western Railroad, and also lessee of the Hartford & Connecticut Western. The Receiver has taken possession of the property. He was formerly Receiver of the Central New England & Western when the road was leased to the Philadelphia & Reading.

—Victor Contamin, the designer of Machinery Hall, at the Paris International Exposition in 1889, recently died at Paris at the age of 53 years. He was educated at the "Ecole Centrale" and, after graduation, was connected for a number of years with the building of gas works in Spain, and with the design and construction of heating and ventilating plants. He was also at one time a member of the faculty of the "Ecole Centrale," carrying on his work there in addition to professional work as a practicing engineer. He was a member of the Legion of Honor and served also as President of the French Society of Civil Engineers.

—Mr. T. C. McNeely, Superintendent of the main stem division of the Central of Georgia, is now Superintendent of the Augusta & Savannah Division; that road, formerly operated as one of the South Carolina lines of the Central of Georgia, having been added to his jurisdiction last week. The Port Royal & Augusta and the Port Royal & Western Carolina, formerly operated as part of the South Carolina Division of the Central of Georgia, are now operated by their own Receivers. Mr. W. A. Moore, who has been Superintendent of this division, has been transferred to Griffin, Ga., as Division Superintendent in charge of the line between Macon and Atlanta, and the Chattanooga, Rome & Columbus, extending from Griffin to Chattanooga, formerly operated as part of the main stem division.

—Mr. William Mullins, Purchasing Agent of the Pennsylvania company, died at Cresson Springs, Pa., on Aug. 19. Mr. Mullins was nearly 70 years old and had been in the service of the Cleveland & Pittsburgh and the Pennsylvania company for nearly 25 years. He was born in Ireland and spent some years with the Board of Public Works as one of its engineers. He came to the United States in 1848, and after a few years as Assistant Engineer on canal work, took up railroad construction and built portions of the Cleveland & Pittsburgh and several railroads in Wisconsin and other northwestern states. He was associated with the late Mr. Thaw and Mr. McCullough, both Vice Presidents of the Pennsylvania company, in various railroad enterprises. During the civil war he was Purchasing Agent of the Cleveland & Pittsburgh, that position being afterward merged into that of the General Purchasing Agent of the Pennsylvania company.

—Mr. Lucius Tuttle was elected President of the Boston & Maine at a meeting of the directors this week. Mr. Frank Jones has been serving temporarily as President of the road since the resignation of Mr. A. A. McLeod. Mr. Tuttle will assume his new duties after the annual meeting in October. He is now First Vice-President of the New York, New Haven & Hartford, and having practically decided to accept the Presidency of the Boston & Maine some weeks ago, he has been engaged in arranging to leave the service of that company and he has practically severed his connection with it.

Mr. Tuttle was born in Hartford, March 11, 1846. He entered railroad service as a ticket clerk in August, 1865. For two years he was General Ticket Agent of the Hartford, Providence & Fishkill Railroad. Subsequently he became the General Passenger Agent of the New York & New England road, a post which he held for about one year. From 1879 to 1885 he was in the employ of the Eastern Railroad, first as General Passenger Agent, and next as assistant to the General Manager. He was General Passenger and Ticket Agent of the Boston & Lowell road, now part of the Boston & Maine, from 1885 to 1887. Next he served the Canadian Pacific as Passenger Traffic Manager in Montreal. In 1889 Mr. Tuttle was appointed Commissioner of the Passenger Department of the Trunk Line Association, a place which he held about one year. From there he went to the New York, New Haven & Hartford Railroad as General Manager.

—Mr. Cornelius Shields, General Superintendent of the Western Division of the Great Northern, has resigned that position to become General Superintendent of the Chicago Great Western. Mr. Shields is 37 years old and began railroading 22 yeaas ago as water carrier for a construction crew on the Southern Minnesota, now part of the Chicago, Milwaukee & St. Paul system. He was next a section hand, then a telegraph operator for a year. After that he was a station agent for six years, when he was promoted to be a train dispatcher, and subsequently to be Chief Train Dispatcher of the same road. In 1882 he was appointed Chief Train Dispatcher of the Canadian Pacific, and later was promoted to the position of Assistant Superintendent of the Western Division of that road. In 1886 he entered the service of the St. Paul, Minneapolis & Manitoba, and, as Superintendent, had charge of the construction of the extension from Minot, S. D., to Great Falls, Mont. In 1888 Mr. Shields was appointed General Superintendent of the Chicago, St. Paul & Kansas City, now the Chicago Great Western. He continued in that position until April, 1892, when he resigned to become General Superintendent of the Western Division of the Great Northern, which latter position he now resigns to return to the one held by him previous to accepting it.

—Mr. John W. Kendrick, who was appointed Acting General Manager of the Northern Pacific, to succeed the late Mr. W. S. Mellen, has been appointed General Manager by the Receivers of that company. Mr. Kendrick is in his 40th year, and was graduated from the Worcester Polytechnic Institute in 1873. In 1879 he began his railroad career as levelman on the Yellowstone line of the Northern Pacific, then constructing. During 1880 he was engaged on permanent location of the road, and for the next two years was in charge of construction of 160 miles of track of the Missouri and Yellowstone divisions. In 1883 he was appointed Chief Engineer of the St. Paul & Northern Pacific, and in 1888 was appointed Chief Engineer of the Northern Pacific, succeeding Gen. Adna Anderson, deceased. His jurisdiction has since been extended over all leased lines, including the Wisconsin Central, Chicago & Northern Pacific and Chicago & Calumet terminal. Mr. Kendrick is particularly well qualified to discharge the duties of his new position, as his knowledge of the property and the needs of the country through which it passes is very complete. While he was Chief Engineer much important work has been accomplished, notably the Cascade Tunnel, the Little Falls-Staples and Gallatin-Butte cut-offs, the construction of the Northern Pacific & Manitoba, the extension to the Big Bend (Wash.) country besides many other Washington and Montana branches, and the Como and Edison shops. Mr. Kendrick retains the title of Chief Engineer.

ELECTIONS AND APPOINTMENTS.

Central of Georgia.—The Augusta & Savannah Rail road is to be operated as a part of the main division and included in the jurisdiction of T. C. McNiely, Superintendent. The road from Macon to Atlanta and the Chattanooga, Rome & Columbus will hereafter constitute a division known as the Northern Division, office at Griffin, Ga., with W. A. Moore as Superintendent.

Chicago Great Western.—Cornelius Shields has been appointed General Superintendent with headquarters at St. Paul, Minn.

Colorado Fuel & Iron Co.—The annual meeting held in Denver on Aug. 16 resulted in the election of the following directors: J. C. Osgood, H. R. Wolcott, Dennis Sullivan, W. H. James, C. H. Toll, J. L. Jerome, A. C. Cass, C. M. Schenk and J. A. Kebler, all of Denver; D. C. Beaman and C. F. Meek, of New York; W. L. Graham, of Pueblo, and Paul Morton, of Chicago. The directors elected the following officers: J. C. Osgood, President; Henry R. Wolcott, Paul Morton and J. A. Kebler, Vice-Presidents; J. L. Jerome, Secretary and Treasurer; A. C. Cass, Assistant Treasurer; W. A. Rose, Assistant Secretary; J. A. Kebler, General Manager; C. H. Parmelee, Assistant Secretary and Assistant Treasurer at New York.

Crystal River.—The annual meeting of the company, an adjunct of the Colorado Fuel & Iron Co., was held on Aug. 16, resulting in the election of the following directors: J. C. Osgood, H. R. Wolcott, Dennis Sullivan, Paul Morton, C. H. Toll, John L. Jerome and J. A. Kebler. The directors elected the following officers: President, H. R. Wolcott; Vice-President and General Manager, J. A. Kebler, Denver; Secretary, John L. Jerome; Treasurer, A. C. Cass; Assistant Treasurer, C. H. Parmelee, New York City.

Georgia Pacific.—S. H. Purcell, having resigned the position of District Superintendent, with headquarters at Columbus, Miss., the office has been abolished. C. A. Wickersham has been appointed Assistant Master of Trains.

Lehigh Valley.—A number of appointments were announced, last week, of officers formerly in the service of the company, who have held positions with the Philadelphia & Reading since the lease. The appointments included the following: The General Traffic Manager, John Taylor, and the Purchasing Agent, Wm. C. Alderson; the General Solicitor and assistant to the President, Henry S. Drinker; the Comptroller, Isaac McQuilkin, and the Real Estate Agent, J. F. Shaperkotter, all of whom have, during the Reading lease, been in the joint service of the Lehigh Valley and Reading companies, resume the positions in the above company held by them prior to the lease. Isaac McQuilkin, Comptroller, has made the following announcements: Wm. W. Weaver, Auditor of Coal Traffic; Winfield C. Scott, Auditor of Freight Receipts, and Edward M. Tracy, Auditor of Passenger Receipts, all with offices at Philadelphia. The Disbursing Department will remain as formerly, under the immediate charge of the comptroller. Edward Y. Hartshorne has been appointed Assistant Purchasing Agent.

Mexican Central.—A. L. Van Antwerp, for several years connected with the traffic department of the Atchison, Topeka & Santa Fe, has been appointed Assistant General Freight Agent of this road, with headquarters at the City of Mexico.

New York & New England.—F. E. Dewey, Superintendent of the Eastern Division, who is also Superintendent of the Norwich & Worcester Railroad, has removed the headquarters of his division from Boston to Putnam, Conn.

Norfolk, Albemarle & Atlantic.—The position of General Superintendent of the road made vacant by the death of J. M. Dickey has been abolished. B. P. Holland has been appointed Acting Superintendent, with headquarters at Norfolk, Va., and will have charge of the operation of the road.

Northern Pacific.—The Receivers have appointed John W. Kendrick General Manager of all lines and property west of St. Paul and Ashland, and Samuel R. Ainslie General Manager of the Wisconsin Central system, Chicago & Northern Pacific Railroad, Chicago & Calumet Terminal Railway, and all leased and operated lines east of St. Paul and Ashland.

Wisconsin Central.—The receivers of the Northern Pacific and leased lines have confirmed Samuel R. Ainslie as General Manager of this road, also of the Chicago & Northern Pacific and the Chicago & Calumet Terminal.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Augusta Southern.—The time for changing the gauge of this road to standard, between Augusta and Sandersville, 80 miles, has not yet been definitely fixed upon, and the work will hardly be undertaken before spring. The necessary surveys will be made at once. The company has recently leased the Sandersville & Tennille road. This is standard gauge, and a third rail will be laid at once so that the Augusta Southern trains can run through from Augusta to Tennille, Ga., where a connection is made with the Central of Georgia. W. Bailey Thomas, of Augusta, is General Manager.

Baltimore & Drum Point.—The contract has been recently let for completing the main line of this road at Drum Point, Md. The contractors under the construction company are Van Aken & Hays, of New York City. It is expected that the road will be ready for operation in January next. The road begins south of Baltimore and extends through the counties of Anne Arundel and Calvert to Drum Point, a distance of 80 miles. The road is now nearly all graded for this distance and the bridges built. It is proposed to begin the tracklaying about Sept. 10. J. H. McCreery, of Washington, D. C., is General Manager of the construction company which is to complete the road, and D. Howell is Chief Engineer. The officers of the railroad company are: Edward Lauterbach, President, New York; F. R. Beidler, Vice-President; John C. Rose, General Solicitor, and H. H. Beidler, Baltimore, Secretary and Treasurer. The name of the railroad when completed and ready for operation will probably be changed to the Washington & West Shore Railroad.

Baltimore & Ohio.—The plan for making a double track road of that part of the line from Pittsburgh, Pa., to Cumberland, Md., has been abandoned for the present on account of the stringency of money matters. The making of this division part of the main line from east to west had made necessary many improvements, and it has been decided to reballast it with stone almost throughout its length. This work has already been commenced and thousands of tons of stone for ballast have been delivered. The division mentioned was laid with new rails last winter and spring.

The company has steam shovels at work on the Grafton & Greenbrier Division, filling in all the trestles, which are quite numerous, and putting the line into condition for running heavy trains over it regularly. The work will occupy several months and will open regular connections between the main line of the Baltimore & Ohio and the West Virginia Central & Pittsburgh, by way of Belington, W. Va.

Burlington & Missouri River.—The contractors are reported to have completed the grading on the extension beyond Sheridan, Wyo., north to the Montana State line, a distance of about 25 miles beyond the town of Sheridan, and the track has been laid for perhaps one-half this distance. The construction work has been suspended, and it is not known whether the tracklaying to the Montana State line will be finished this year or not. Kilpatrick Bros. & Collins, who had the contract, have discharged all their men. The sub-contractors have been leaving the work for some weeks, as the contracts were completed, and no new work was awarded.

Canadian Pacific.—The completion of the tracklaying on the line through Assiniboia is reported in the press dispatches. The track was laid to the town of Stirling, near the International boundary line, on Aug. 12, and it was expected that it would be connected with the Northwestern extension of the Minneapolis, St. Paul & Sault Ste. Marie some day this week, as less than 25 miles of track remained to be completed in North Dakota, to make the junction at Stirling. The Canadian Pacific branch leaves the main line at Pasqua, a station west of Regina, and extends southeast through Assiniboia to Stirling on the International boundary line, a distance of 160 miles.

Central Counties.—Mr. Cunningham, President of this road, says the company is prepared to make direct railroad connections between Cornwall, Ont., and Ottawa if the two towns will bonus the line. The sum of $50,000 is asked from Ottawa, Ont.

Central of Pennsylvania.—The reports of the progress of the construction work on this road, printed in the local papers, state that the work is being pushed vigorously, and that 800 men are being employed at present. The grading has been completed for over 12 miles beyond Bellefontaine, Pa., the southern terminus, and the tracklaying has begun at that town. The principal work now being done, however, is on the northern end of the line between Mill Hall and Bellefontaine and the four or five iron bridges on that section will be built shortly. The line is 27 miles long, and is being built by J. W. Gephart, of Bellefontaine, Superintendent of construction.

Cherry Springs.—This road is one of the short branches being built in the interests of the Sinnemahoning Valley road in the northern counties of Pennsylvania, but under separate charters. It is now built through Potter County, Pa., from Hulls to a point near Cherry Springs, about nine miles. It connects at Hulls with the Buffalo & Susquehanna road, built in the same interest, and arrangements have been made to merge the line with that company. All these roads are controlled by Goodyear Bros., of Buffalo, N. Y., and Austin, Pa.

Cleveland, Cincinnati, Chicago & St. Louis.—The company has just completed a second track from the union station at Indianapolis to the east end of its "Belt Yards," a distance of about three miles, and has started the extension of second track from Fernbank, O., to Cleves, O., a distance of about four miles. The former of these two pieces of work includes in its construction a bridge over Pogue's Run and a bridge over Pleasant Run. It makes a double track crossing of the Indianapolis Union Railroad requiring quite an extensive interlocking signal system. The work between Fernbank and Cleves will be light except the construction of a three-span stone arch bridge over Muddy Creek. This bridge is composed of three segmental arches, each having a radius of 45 ft. It rests upon pile foundations and is being built by Contractors Fisher & Fisher, of Cleveland. Its estimated cost is in the neighborhood of $35,000. No contracts have been let for the grading, which will be light. The second tracking is in charge of Geo. W. Kittredge, Cincinnati, Chief Engineer.

Coal River & St. Albans.—The company called the St. Albans & Coal River organized in 1892, chiefly by property owners along the route between St. Albans, W. Va., and Boone Court House, has transferred its franchise and property to the above company, organized in West Virginia last week. The new company is composed of the representatives of Eastern capitalists, who, within the past month, has taken hold of the proposed line begun some months ago between St. Albans, W. Va., and Boone Court House. It is to open up the large coal properties bought last fall from McKell and others by Drexell, Morgan & Co., as representatives of the Chesapeake & Ohio.

Delaware & Hudson.—Drake & Stratton, of Pittsburgh, have the contract, and are now at work grading, for the new roadbed in Scranton, Pa., from the foot of Vine street to Lackawanna avenue, that is to connect with the main line. The branch will be used to run cars from the main line to the new station, which, it is expected, will be completed within a year.

Denver & Rio Grande.—The Irwin extension has been completed, and the Colorado Fuel & Iron Company will soon begin the erection of coal breakers and other machinery to handle the anthracite coal at the terminus of the branch. It is 11 miles long, beginning at Crested Butte, Col., and ending at the Ruby anthracite mines.

Levy & Moore, railroad contractors, began grading last week for a branch of about two miles, extending the Chandler Creek branch up Bear Gulch to the United Coal Company's new coal mine near Florence, Col.

Dun Glen.—The first rails on this road were laid last week, starting at Riverside, W. Va. The line is to extend ten miles from the Chesapeake & Ohio road into the McKell coal lands recently bought for development, following the line of Little Loup Creek all the way. There are already four coal companies at work getting ready to ship coal as soon as the road is completed. These are the Glen Loup Coal Co., the Collins Coal & Coke Co. and the Harvey Coal & Coke Co., and they find a clean seam of coal from 5 to 7 ft. in thickness on the level with the railroad grade.

Elk Mountain.—It is announced that the funds to complete this enterprise have been secured, and that active work on the construction will begin in October

and the track laid this year. This statement is made by Orman & Crooke, railroad contractors, of Pueblo, who now hold the title to the partly graded road as security for the grading done about a year ago. The directors of the company are mostly residents of Pennsylvania, and have just arranged for the transfer of the property from Orman & Crooke. The line extends from Carbondale, on the Denver & Rio Grande and Colorado Midland roads, to Marble, Col., where quarries of several varieties of marble are located. It also touches extensive deposits of anthracite and bituminous coal which have already been developed, and large quantities will be shipped as soon as the road is completed. These valuable mineral deposits are owned by the railroad company, and there is little doubt that the road will be completed soon.

Everett & Monte Cristo.—It was expected to complete the tracklaying on this road into Monte Cristo, Wash., about Aug. 20, and it is unlikely that any delay occurred to prevent the work being completed some day this week. The road is 69 miles long and begins at Everett Junction on Puget Sound, and extends west through the valley of the Stilliguamish River for the greater part of the distance, to the mines at Monte Cristo. The contractors are Henry & Balch, of Minneapolis. The mines at Monte Cristo and Silverton have been working for some time, and large quantities of ore have been taken out, and on the completion of the road to Monte Cristo will be shipped to the smelters at Everett. Freight trains have been running to Silverton, 14 miles east of Monte Cristo, for some weeks. Passenger trains will not be put on at present. S. B. Fisher, of Everett, Wash., is Superintendent and Chief Engineer.

Jacksonville, St. Augustine & Indian River.—The track has now been laid to Turkey Creek, four miles south of Melbourne, Fla., which was the end of track in July. Contracts have also been let for creosoted piling for use in the St. Lucie and Jupiter rivers to the Old Dominion Creosoting Works, Norfolk, Va., and for plate girder drawbridges for same rivers to the Youngstown Bridge Co., Youngstown, O.

Midland Terminal.—The completion of the construction on this line has been indefinitely postponed, and the ties piled up along the grade have been removed to go into betterments on the Colorado Midland at other points. The grading is completed from Divide Station to Midland, Col., and is partly completed to the Cripple Creek mines.

Minneapolis, St. Paul & Lake Superior.—The officers report that the entire line is located and partially cross-sectioned. The prospect of building depends, of course, on the condition of the financial market. The contract for grading is already let to Messrs. Samuel & D. W. Grant, of Faribault, Minn. The financial arrangements are reported to be partially completed, and two-thirds of the bond issue is at present underwritten, and negotiations are progressing favorable for the balance. The route is from the city of St. Paul in a northeasterly direction through White Bear, Amidor, Yellow Lake, to West Superior, Wis., 137 miles. Donald Grant, of Faribault, is President; F. H. Anson, Minneapolis, General Manager, and F. D. Woodbury, Minneapolis, Chief Engineer.

Mt. Carbon Coal Co.—This company will build a short line of standard guage railroad from its mines to a connection with the Chesapeake & Ohio Railroad near Charleston, W. Va. The piece of road will be expensive on account of heavy grading. The contract for it was let on Aug. 26.

Minneapolis, St. Paul & Sault Ste. Marie.—The extension to the international boundary was completed this week. In May, 1892, the contract for the first section of the extension, from Valley City, N. D., northwest along the Sheyenne River, was let to Linton & Co., of Minneapolis. Subsequently the construction of the entire extension was let to the same contractors, and at the close of the season of 1892 the track had been laid to Cathay, N. D., 80 miles northwest from Valley City. The grading had been completed 28 miles beyond Cathay, but unfavorable weather prevented tracklaying on this section. Early last spring work was resumed, and has continued without intermission since that time, and 184 miles of track has now been laid. The line crosses the Northern Pacific at Carrington, and the Great Northern at Minot, N. D. From the latter point it still runs in the valley of the Mouse River to the River des Lacs, and in turn through the valley of that river to and around the Des Lacs chain of lakes, then in an air line to the Canadian boundary. In the valley of the Des Lacs there are four double-deck and a number of pile bridges crossing that river. The heaviest work is also in this section, some of it reaching 50,000 yds. per mile, and the entire stretch averaging 25,000 yds. After leaving the bluffs, beyond the Des Lacs lakes, the work is comparatively light. The point of junction with the Canadian Pacific at the boundary is Stirling, and from that place the Canadian Pacific branch extends northwest 160 miles through Assiniboia to the main line at Pasqua.]

New Roads.—The City Council of the town of Joliette, Que., has agreed to grant a bonus of $25,000 toward the construction of a line of railroad between this town and Quebec.

Norfolk & Western.—The short branch road of the Castle Rock Mining Co., near Roanoke, Va., has been completed from the connection with the Norfolk & Western to the coal mines, and shipments of ore will soon begin.

Ottawa, Arnprior & Parry Sound.—The contract for constructing the roadbed from Brudenell, Ont., ten miles westerly, has been awarded to William Heald, who will begin work at once.

Philadelphia & Reading.—The Philadelphia & Newtown Connecting railroad, a short branch which has been built this year to connect the Philadelphia & Newtown branch with the New York Division of this road, was opened for traffic on Aug. 17, when the first train was run over the road into the new Terminal Station at Twelfth and Market streets, Philadelphia. The branch extends from Olney, on the Philadelphia & Newtown, to Logan Station, on the New York Division, and is only 1¼ miles long, but has been expensive to construct.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Work on the New Cumberland extension of this line in West Virginia has been almost abandoned. The grading has been completed as far as Porter's and the rails are down as far as Kennowith. The work will be continued with a small force of men until the Wells Farm syndicate property opposite Walker's is reached, when it is expected the work will be suspended indefinitely. The estimated cost of the work to the Wells Farm is $12,000.

Red River Valley & Western.—Grading is finished and tracklaying will be completed this week to the headquarters of the Amenia & Sharon Land Co., 12 miles west of Addison, N. D. Foley Brothers & Guthrie, of St. Paul, are the contractors.

Seattle & Northwestern.—The engineering party which has been running a preliminary survey of the railroad from Seattle, Wash., to a junction with the Great Northern has returned to Seattle. The chief of the party announces having found a route with a maximum grade of 40 ft. The new route will shorten the present Great Northern line into Seattle 40 or 50 miles. Nothing further will be done in field work this fall owing to the financial stringency. Judge Thomas Burke, of Seattle, is President of this road.

St. Louis, Chicago & St. Paul.—The company has been building extensions from both ends of the line, north to Springfield, Ill., and south to Kinders, near East St. Louis, but the construction work has been temporarily suspended on account of the condition of the money market, and the consequent inability to place the railroad securities, or secure funds for the purpose of completing the line. The situation at present is as follows:

Work was begun in 1892 on an extension from Loami north to Springfield, 12 miles, crossing the Wabash Railroad at Curran. That part of the new line between Loami and Curran is completed and in use. The track is laid from Curran to the Springfield city line. There remains yet to be completed about half a mile in the city of Springfield, which would require about 60 days.

The line from Alton along the Mississippi River to Kinders is graded, the bridges are built and everything is ready to lay the track, but nothing further will be done until there is a decided change in the money market. The branch is about 20 miles long. F. P. Read, Chief Engineer, with office at Springfield, is in charge of the work.

Tivoli Holler.—Walter Melius, of Albany, N. Y., Civil Engineer, is in charge of the construction work now being done on this railroad in the city of Albany, N. Y. About one and a half miles of road is being built from a junction with the railroad of the Delaware & Hudson Canal Co., near the Hudson River, to a connection with the New York Central & Hudson River Road in the western part of the city.

Wheeling Bridge & Terminal.—General Superintendent Taussig, of this company, reports that a force of men will be put to work as soon as possible rebuilding a large section of the stone wall along the bank of Wheeling Creek which fell a few weeks ago, leaving a part of the main track unsupported. A temporary track has been built around the break in the wall. It will take about $5,000 worth of rough masonry to repair the break. The extension of the three mile line to Benwood is progressing; most of the piling is in place and work on the grading at the lower end of the line is under way. The bridges over Boggs' Run and the ravine above the Riverside mill will be erected in a few weeks.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The company announced last week that it has arranged for the extension of its six per cent. guarantee fund notes, $7,000,000 in amount, for five years from Nov. 1, when they mature. The extension will be at the present rate of interest, and both principal and interest will be payable in gold.

Baltimore & Ohio.—The company reports gross earnings of its entire system for July of $2,105,324, an increase of $18,768 as compared with the same month of last year, and net earnings of $683,427, an increase of $158,108.

Chesapeake & Ohio.—The earnings for the fiscal year ending June 30 are reported as follows, in the annual report just issued:

	1893.	1892.	Inc.
Mileage	1,192	993	199
Gross earn	$10,336,810	$9,004,599	$1,332,211
Oper. expen	7,132,760	6,731,731	401,029
Net earn	$3,204,050	$2,272,868	$931,182
Fixed charges	2,780,289	1,881,548	898,741
Surplus	$423,761	$391,320	$32,441

Catasauqua & Fogelsville.—The directors have decided to accept the proposition of the Philadelphia & Reading Receivers to extend the debenture five per cent. bonds, which matured on July 1 last, for a period of five years at the same rate of interest. The railroad, which extends from Catasauqua to Rittenhouse Gap, is operated by the Reading, which owns a controlling interest in the stock.

Lehigh Valley.—The Philadelphia & Reading Railroad Company has arranged to pay its debt of $978,000 to the Lehigh Valley Company by transferring coal of that value, about 400,000 tons. The inability of the Reading to pay this debt was given as the reason for the annulment of the lease of the Lehigh Valley road.

TRAFFIC.

Traffic Notes.

On Aug. 5, 119 cars of fruit were sent eastward from Sacramento, Cal., said to be the largest amount of such fruit ever shipped from one place in one day.

The Pennsylvania Railroad has notified consignees in Philadelphia that those who wish to have peaches come by freight from Maryland and Delaware without prepayment must deposit with the road $1,000 as a guaranty.

The passenger business of the Houston & Texas Central and the Southern Pacific is now carried between Houston and Galveston, Tex., by the International & Great Northern, the four-year contract with the Gulf, Colorado & Santa Fe having expired.

The United States Circuit Court in South Carolina has released the Agent of the Richmond & Danville at Prosperity, who was arrested for delivering packages of liquor received from points without the state. The state law prohibiting commerce in liquor is held to be void under the Interstate Commerce law, though the main basis of this decision seems to lie in certain other defects of the liquor law.

Chicago Traffic Matters.

CHICAGO, Aug. 23, 1893.

The people of the Southwestern Traffic Association are experiencing further difficulty in making their new agreement effective. The Rock Island, not a member of the Southwestern Rate Committee, recently published rates to Texas points considerably lower than agreed Association rates. In order to do this that line was obliged to secure a Southern connection, which it did through the Texas & Pacific. Thereupon, at the last meeting of the Rate Committee the Atchison gave notice that unless the tariffs were withdrawn it would withdraw from the Committee at the expiration of 90 days. Such action means the practical disruption of the Committee and the consequent failure of the new Association. A meeting was held in this city yesterday to consider the notice of the Atchison, but nothing was accomplished, on account of the absence of the Texas & Pacific. The meeting was continued to-day.

It is announced that a meeting of Trans-Continental lines will be held in this city on Aug. 28, for the purpose of agreeing upon an advance in rates.

Texas roads continue to publish passenger rates to Chicago below the agreed scale. The Western Passenger Association has refused to accept less than agreed proportions on this business, thus forcing the lines quoting the reduced rates to stand the shrinkage.

The Western Passenger Association has finally agreed to make half rates for passengers to Chicago on "Illinois day," with a seven day return limit. This probably means that half rates will now be made for all state and special days during the remainder of the Fair. Many of the roads were not in favor of establishing this precedent.

The Western Passenger Association, at its meeting on Aug. 17, rescinded its former action in respect to rates for the Grand Army encampment at Indianapolis and reduced the rates via St. Louis to the sums of the locals via Chicago, thus giving the veterans the option of going either way. It was considered inexpedient to adopt the plan of selling tickets going one way and returning another, in view of the demoralization which would be likely to follow. Regular World's Fair tickets will be used to Chicago and St. Louis and passengers will be routed on extension tickets via any line beyond these points.

The Western Freight Association endeavored to prevent a demoralization in rates on flour from Minneapolis to the seaboard likely to be caused by the cut of the Lackawanna, but as usual was unsuccessful and notice has now been given that on account of the action of the Soo line in meeting the Lackawanna cut, through rates may be quoted from Minneapolis, St. Paul, etc., to New York, at 27½ cts. per 100 lbs., and Boston, 29½ cts., leaving the question of divisions to be settled later.

The Union Pacific has given notice of a passenger rate of $25 first class from all Missouri river gateways to Helena, Butte, Spokane, and Portland, Or., either way, and $18 second class, westbound only.

Notice has been given by the Chairman of the Passenger Department of the Central Traffic Association that on account of advices received from some of the members to the effect that lines not members of the Association have made engagements to join with the Western lines in quoting harvest excursion rates, thus compelling them to take similar action, it is, therefore, impossible to continue longer in effect the resolution adopted at the August meeting, not to participate in any such excursions, and each line is at liberty to take individual action.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending Aug. 19 amounted to 44,852 tons, against 52,042 tons during the preceding week, an decrease of 7,190 tons, and against 52,638 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Aug. 19		W'k to Aug. 12.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	5,780	12.9	6,597	12.6
Wabash	3,253	7.3	4,516	8.7
Lake Shore & Michigan South.	5,583	12.5	7,266	14.0
Pitts., Ft. Wayne & Chicago	5,219	11.6	8,087	15.5
Pitts., Cin., Chicago & St. Louis	6,319	14.1	6,625	12.7
Baltimore & Ohio	2,345	5.2	2,551	4.9
Chicago & Grand Trunk	3,626	8.0	3,509	6.8
New York, Chic. & St. Louis	3,797	8.5	4,324	8.3
Chicago & Erie	7,030	15.7	6,892	13.3
C., C., C. & St. Louis	1,900	4.2	1,675	3.2
Totals	44,852	100.0	52,042	100.0

Of the above shipments 1,120 tons were flour, 15,208 tons grain and millstuff, 10,705 tons cured meats, 10,073 tons dressed beef, 1,287 tons butter, 1,105 tons hides and 3,421 tons lumber. The three Vanderbilt lines carried 33.9 per cent., the two Pennsylvania lines 25.7 per cent. The Lake lines carried 74,890 tons, against 77,883 tons during the preceding week, a decrease of 2,993 tons.

(*Other Chicago traffic news will be found on page 640.*)

The Nebraska Freight Rate Law.

The State Board of Transportation which, in the suits brought by the railroads, was enjoined from enforcing the Newberry rate law recently passed in Nebraska, has filed its answer in the Federal Court. The answer refers to only one case, that of the Chicago, Burlington & Quincy. It is denied that this road is a foreign corporation. The Nebraska Constitution authorizes the legislature to pass reasonable maximum rate laws, and this Constitution was in force at the time of the Burlington consolidation in 1880; thus the Burlington submitted to it. By this Constitution the legislature has the absolute right to determine what are reasonable rates, or the legislature may leave it to a court. In the Newberry law the legislature referred all litigation on this subject to the Supreme Court of the state.

The fourth point made is that these rates are not confiscatory. The Burlington claims that its bonded debt is $123,000,000, of which $46,000,000 lies in its Nebraska lines. This is denied and it is stated that only $25,000,000 lies in Nebraska. The complainant also states that its capital stock is $76,000,000, of which $29,000,000 is in the Nebraska lines. This is also denied, and a showing is made that government, state and municipal aid to the extent of $17,600,000 was given that road in the state, leaving the capital stock in Nebraska not to exceed $15,000,000. And yet this road has paid from 8 to 10 per cent. net dividends on its entire capital stock, which has been watered to the extent of $45,000,000 since 1879. Had this inflation not been effected the dividends would have reached on the actual capital stock 20 to 25 per cent. after all interest had been deducted. This is an excessive and unwarranted percentage of gain. The fifth point is that no railroad has any grievance when it was able to pay interest on its bonded debt, which it would do under the new law.

The sixth point is that by the extension of business and the impetus to settlement the Nebraska railroads would make more money than heretofore. The seventh point is that these new rates are very much lower than the Iowa rates, which the Burlington observes and under which that road is paying handsome profits in Iowa,